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AMERICAN INDUSTRIES, No. 34.

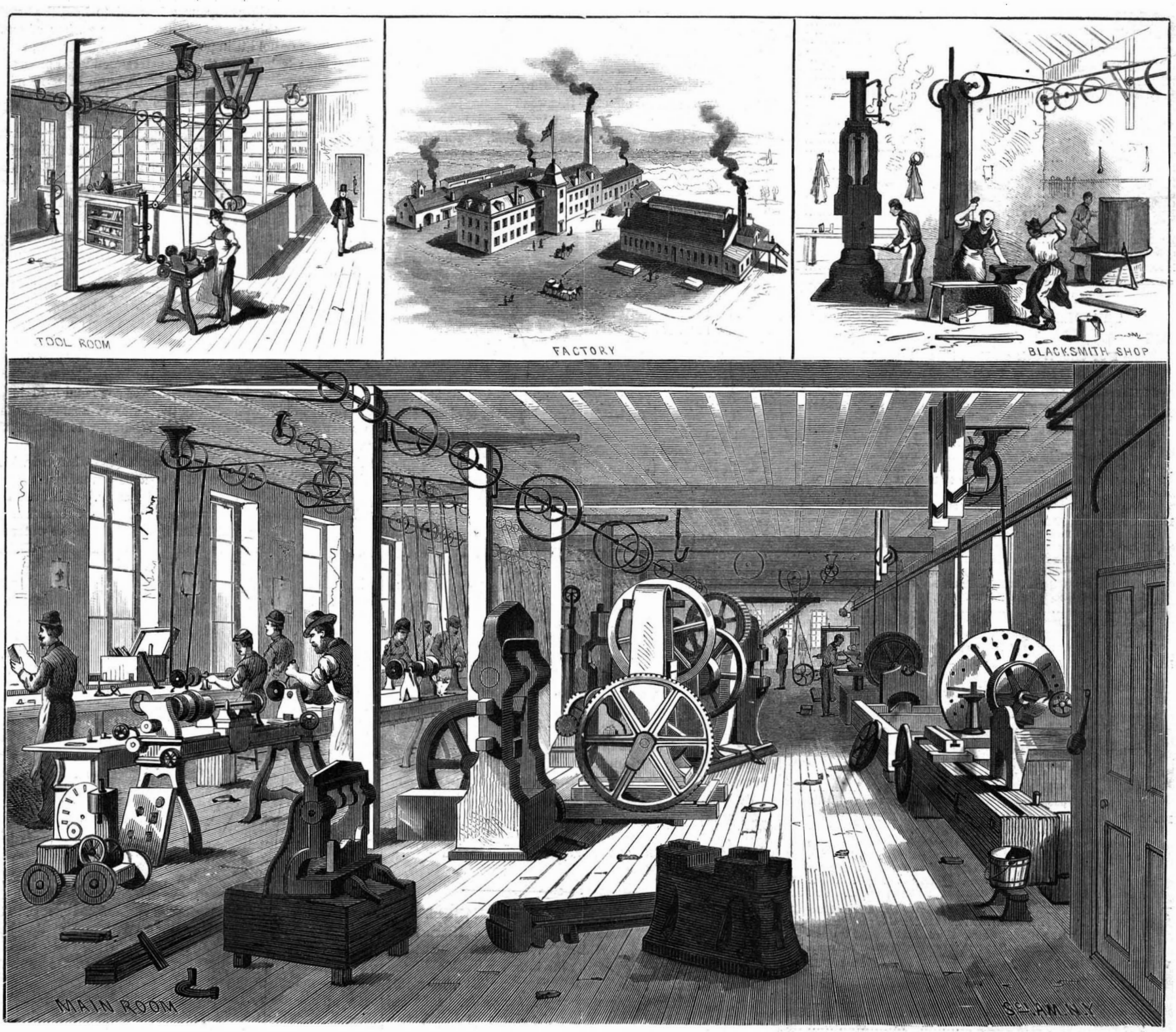
THE MANUFACTURE OF PUNCHING AND DRAWING PRESSES, DROP HAMMERS, DIES, ETC.

The making of machines with which to make other machines has been a peculiarly distinctive idea with American inventors and mechanics. Here this conception practically had its origin, and the extent to which it has been developed within the past twenty years has probably done more to place our manufacturing industries in the front rank, as compared with those of the older countries of the world, than any other one cause. We use machinery vastly more than it is used anywhere else, and in thousands of operations where, even in the best machine shops and factories of France, Belgium, and England, hand labor is employed to do the same work; any invention or improved process of manufacture, therefore, which aids in lowering the cost of machinery, is a direct gain to every branch of manufacturing industry.

Probably no department in metal working has shown a more steady growth, and a development fraught with greater or more general advantages, than the manufacture of power punching and drawing presses, with the drop hammer, for forging, by means of steel dies, a branch of business which affords the subject of the first page illustrations of this paper. The establishment we here represent is that of the Stiles & Parker Press Company, of Middletown, Conn., whose presses have for many years been widely known in every manufacturing section of the United States, as well as in many foreign countries. The company own more than twenty-five patents on presses and drops, several of which were obtained by Mr. Stiles, for inventions he has made since he commenced their manufacture. In 1863 he invented a particularly important feature of the press, the eccentric adjustment, which added greatly to the efficiency of the power and other presses then in use. This invention he patented in 1864, and by its use the punch may be adjusted to the die to the hundredth part of an inch. Before this the punch was adjusted with thin plates of metal above and below the box, but this plan was superseded by the eccentric adjustment. After this patent had been issued, the idea was adopted by Parker Brothers, of Meriden, Conn., who were also manufacturers of presses, and three years of litigation followed, from 1868 to 1871, when the matter was terminated by the consolidation of the interests of both parties to the suit in the Stiles & Parker Company, in which Mr. N. C. Stiles has the controlling interest. By this union, and by subsequent purchase, nearly all the valuable patents affecting the manufacture of presses and drop hammers have come into the possession of the present company.

The use that could be made of the power press twenty-five years ago was exceedingly circumscribed, in comparison with what may be effected thereby to-day. The common method of stopping the press then was to run off the belt, and it was impossible to work it quickly because the punch might not stop at the proper time, and so spoil the job. This difficulty was obviated by the automatic stop, which was patented in 1855, and consisted of "a contrivance for disconnecting the wheel and the shaft at a certain point, after one revolution." When this improvement had been introduced the number of uses to which presses could be applied was greatly enlarged, and their efficiency was largely increased. A great drawback for a long time, however, was in the difficulty which was found in accurately adjusting the punch; the bed was sometimes blocked up, but this was likely to interfere with the accuracy and solidity necessary in all work; screw and nut arrangements were used in light work, but these threw too much strain on the threads of the screws to be generally efficient; the pitman was sometimes made in two parts, between which plates of metal were secured by bolts, but in this way there was danger of getting the bearings out of line. All of these difficulties were, however, obviated by the eccentric adjustment of Mr. Stiles, with which could be obtained: (1) extreme accuracy; (2) the bearings were not thrown out of line by its

[*Continued on page* 165.]



THE MANUFACTURE OF PUNCHING AND DRAWING PRESSES.—WORKS OF STILES & PARKER, MERIDEN, CONN.

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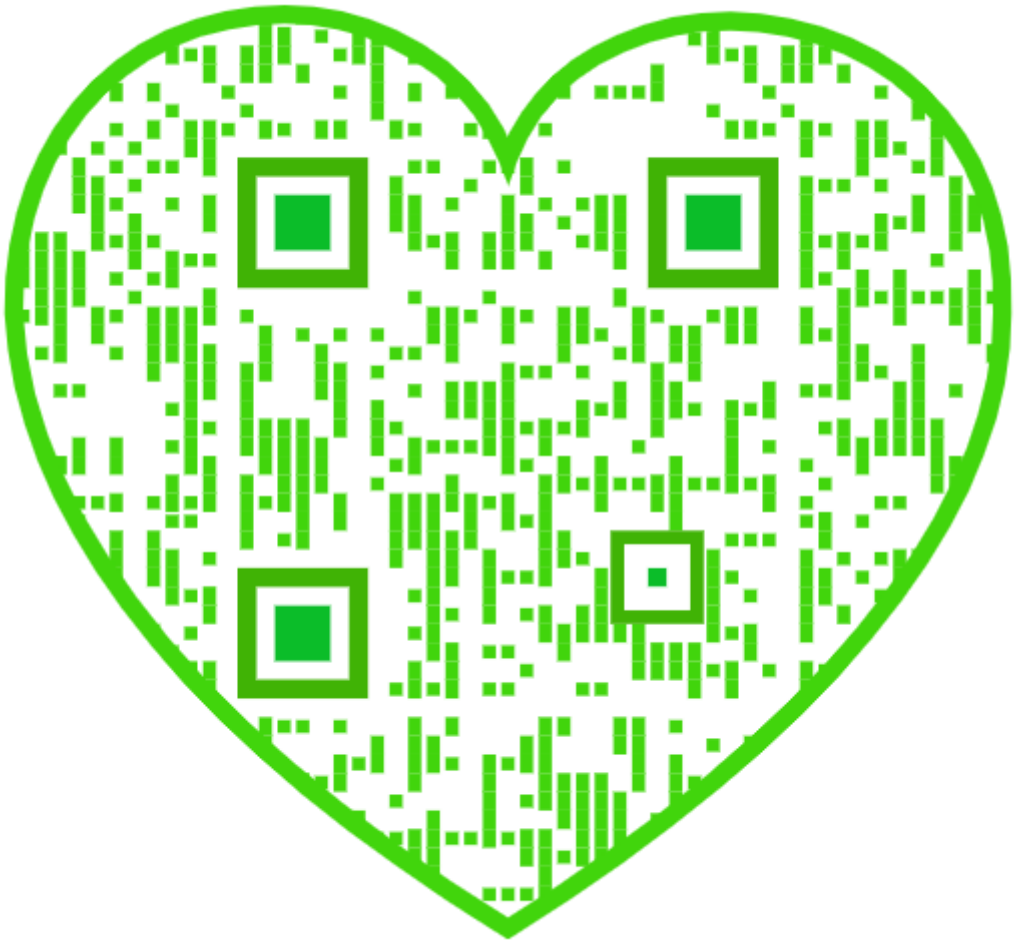

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NEW YORK, SATURDAY, MARCH 13, 1880.

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WHO SHALL HOLD THE SURPLUS?

A large New York drygoods house recently made a calculation as to what effect it would have on their year's trade should every one of their customers purchase, for the year 1880, only $100 worth more of goods than he had bought in 1879; they afterward enlarged the scope of their inquiry and estimated the increased volume of trade should every retail dealer in the country buy $100 worth more than he had bought last year. It is hardly necessary to say that the aggregate amount reached by the figures made on this basis was something which at first appeared to them almost fabulous, representing, as it did, sufficient increase in the demand for goods to make it certain that, with only this seemingly moderate enlargement of trade, every loom and spindle in the country would be pushed to the utmost to supply what would be wanted.

It is very common for men everywhere to base their calculations as to the probable increase in the demand for manufactured goods this year entirely upon the greater ability of consumers to purchase. This enlarged purchasing power of the final customers has been very conspicuously manifested in the agricultural sections, on account of the bounteous crops, coming at a time when there was urgent need and a ready market for them; and in manufacturing communities the increased demand follows because the agriculturists are better off, even more than from the fact that we are now liberal exporters of manufactured articles. But, although these are the true causes of a comparatively permanent improvement in trade, he who would look to them solely for an explanation of the great activity which we have seen in most branches of business during the past six months, and which it now appears more than probable will continue for some time to come, would leave out one of the most important of the factors necessary to a correct judgment. This factor is to be found in the one word, "confidence," which is now general, as against fear and distrust, which everywhere prevailed from the early fall of 1873 to the summer of 1879. How much this means it requires but little to show, so as to bring home the truth to every man's comprehension, although it would be impossible to fully measure the extent of the change wrought

From 1873 up to last summer, no matter how cheaply a dealer or an investor might have bought goods, or how great a "bargain" was obtained, each subsequent purchaser could buy at even lower figures. Prices were on an inclined scale throughout; it seemed as though they would never touch bottom. The natural effect of this was that the jobbers and retailers, the army of middlemen who stand between the producer and the consumer, were compelled, as a matter of self-protection, to hold steadily diminishing stocks of goods. They bought only as they actually needed supplies, and then purchased as sparingly as possible, forcing back upon the manufacturer, or into "first hands," all the surplus in the country which the then limited requirements of consumers did not seem to be making an immediate demand for.

Now all this is changed, and, over and above the quantities of goods which every dealer feels sure he will be able to find ready sale for, all are desirous of having something in stock, or, in other words, to help the manufacturers and the first owners "hold the surplus." The reason is obvious; whereas, heretofore, prices steadily declined, and the demand was always sluggish, the tendency now seems to be invariably upward, the call always active, and most kinds of merchandise, with the present comparatively low rates of interest, offer exceeding desirable channels for the investment of surplus means.

This confidence of dealers, based on the guarantees they have in hand of the ability of consumers to purchase liberally, may, without anything like enthusiasm, be relied upon to maintain the energy and give lengthened vitality to the period of business enterprise upon which we seem to have so auspiciously entered. And in no one of the general divisions of business activity does this renewed life seem to run so high or hold forth such large promise as in those connected with metal working. Iron and steel especially, in all the various forms through which they are made to serve the purposes of man, are now so eagerly sought for, notwithstanding prices have advanced 100 per cent, that our furnaces and foundries and machine shops can hardly begin to satisfy the demand. Railroad building is being pushed with great energy, calling not only for vast quantities of rails, but the locomotives and cars for equipment; factories of all kinds are enlarging their production, and need new machinery; agricultural implements are in greater demand than ever before; the thousands of ingenious devices which the modern residence calls for from the dealer in builders' hardware cannot be supplied fast enough to meet the wants of those who now find themselves able to build; and, above all this, the middleman now seeks to hold an ample supply of each kind of goods as much as he dreaded having a "surplus" before.

REGULATION OF SHIFTING RIVER CHANNELS.

The shifting character of the channels of the Missouri and other Western rivers is well known. With strong currents flowing through beds of light alluvium, the erosion of the banks is constant and frequently very rapid. Under this action, where the circumstances are favorable, bends are formed, not unfrequently taking the shape of loops, with narrow strips of land separating two portions of the river that are several miles apart when measured along the channel. When these narrow strips are washed through, cut-offs take place, which shorten the course of the river, change its slope, increase its velocity, and otherwise disturb its regimen for many miles both above and below. Increased erosion takes place, navigation is impaired, interests along the banks are jeopardized, a different course is given to the river, new bends are formed, and the foundation laid for a repetition of the same series of events at some future day.

The most destructive erosions take place during the falling stages of the water. The foot of the bank is first attacked, and when the material, usually sand, is washed away, the upper portion, being unsupported, tumbles into the water. This eroded material is carried down either in suspension or rolled along the bed of the river. As the current from time to time is checked either by a diminution of the slope or by meeting some obstacle in its course, the material *in transitu* is deposited and for a time at least brought to rest.

These depositions, in their turn, change the course of the river, and cause its current to impinge against the bank in some new locality further down. Thus the operation goes on day after day and year after year.

As the commerce of these rivers increases in magnitude and value, and the lands along their valleys are converted into valuable farms or the sites of towns and cities, it becomes a matter of great importance to prevent such erratic washings of the shores and changes of the channels. To keep the rivers within regular bounds the yielding banks have to be protected, the velocity of the current diminished in certain places, and the channel held in place by building up or solidifying its sides.

The different means employed in this sort of work are described by Captain Hanbury, of the Engineer Corps, in a recent report on the condition of the Missouri river near Omaha. For causing deposits to take place, and for deflecting the current in localities that are to be built out, floating brush obstructions have been applied with marked success. The most successful of these is the floating brush dike, made by taking saplings from 20 to 30 feet long and from 4 to 6 or 8 inches in diameter, and nailing, or fastening to them with wire, scraggy brush of any kind obtainable in the locality. This forms what is known as the "weed." Instead of the saplings rope may be used to hold the brush. To one end of this "weed" is attached an anchor of sufficient weight to hold it in position against the current; to the other a buoy to hold up the downstream end and prevent it from going to the bottom under the pressure of the current against it. These "weeds" are placed from 10 to 20 feet apart, thus forming the floating dike.

Their action is to check the current gradually without producing that scouring effect to which the solid dike gives rise. This done, a portion of the material that is rolling along the bottom or being carried down in suspension is deposited, and causes a rise in the bed of the river, which changes its channel to the direction desired. The rapidity with which these deposits take place is truly wonderful. One season is often sufficient to raise the river bed up to the limits of ordinary high water.

Another form of obstruction that has been tried with success is the willow curtain. This, as its name indicates, is made of willows about an inch in diameter or larger, fastened parallel with each other, and from 6 to 8 inches apart, by means of wire. The curtains can be made of any desired length and width. They are anchored in position by weights attached at intervals along the lower edge and held in an upright or inclined position in the water by floats made fast to the upper edge. Their action is similar to that of the "weeds."

Another form that has been experimented with and which bids fair to give good results, is a screen made totally of wire something after the fashion of a seine. It is anchored and buoyed like the willow curtain. The rootlets and small vegetable fibers that float in large quantities in the water accumulate upon the wires, and form obstructions sufficient to check the velocity of the current.

For resisting the impact of the current and preventing the erosion of the banks, a variety of devices have been tried with more or less success. Among the most satisfactory of these are the woven brush revetment, the continuous mat, or brush blanket, made of brush, sewed together with wire, and the willow screen, made as above described, for the willow curtain, excepting that the willows, instead of being placed some inches apart, are as nearly as possible in juxtaposition. The manner of using all of these devices is the same. The bank to be protected should first be graded to a slope of about 2 upon 3 or less, an operation that can be very cheaply performed by the use of hydraulic force pumps, after which the revetting should be put on so as to extend from the ordinary high water limit down the bank and out along the river bed sufficiently far to protect the slope should any unusual scour take place. The total width is usually in the neighborhood of 100 feet. To sink that portion which is under the water, a small quantity of rock is sometimes necessary, but usually the current itself and the sediment that collects on the brush will suffice for this. The effect of this revetment is to thoroughly protect the bank over which it is placed, and to cause a deposit of sediment over itself that crowds the current away from the bank toward the middle of the stream.

In proportion to the results obtained on the Missouri, these devices are the cheapest that have yet been tried for the improvement of sediment-bearing rivers. The brush dikes cost about $1 a running foot; the revetment of the banks from $2.25 to $2.50 a foot.

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THE DRIVE WELL IN NEW YORK CITY.

It is only within a comparatively recent period that manufacturers and others using large amounts of water in their business have learned how costly that fluid is in some of our principal cities, and especially in New York. According to the city charter, the large users of water from the city mains, such as hotels, factories, breweries, and in fact business establishments of every kind,are now compelled to put in water meters, so that the quantity they consume may be accurately determined, and the amount they must pay be regulated thereby. The law requiring this remained for a long time almost a dead letter, on account of differences of opinion as to what form of water meter was the best, but during the last year or two the Commissioner of Public Works has been energetically pushing forward the introduction of a meter chosen by that department, and therewith has come a great change in the size of almost everybody's bills. Heretofore the amount of the water tax for different establishments had been fixed upon estimates of the quantity required, but now the water used must be paid for according to the registers of the water meters, which make the cost in some cases a hundred fold greater than it was under the old system. There are many instances where this charge upon manufacturers has amounted to as much as $5,000 a year, and in other cases the tax for the water used, measured by the meters, would have been fully equal to $15,000 to $20,000 a year.

On many grounds it is a great advantage to manufacturers of different kinds to be located in large cities, and the industrial interests of New York City, aside from those directly connected with its imports and exports, have been principally instrumental in drawing together the large populations now dwelling on Manhattan Island and the immediate suburbs on the North and East Rivers. Here the workmen can be found in sufficient numbers, in any and all trades, to give the employer an opportunity to select his hands, or to put on extra help at any time; here also we have the first market for many kinds of raw material and the largest market in the country for all kinds, both domestic and foreign, as well as the best point for the sale of the goods. Against these advantages, however, city producers have to pay much higher rents and heavier taxes than those located in rural districts, and, before the enforcement of this enormous water tax was effected, the competition with manufacturers in other places was in many cases a very close one. It would seem that the city should be more liberal in such matters, with a view to encouraging the growth of diversified manufacturing industries here, but the Department of Public Works find that the consumption of water is increasing so rapidly that it will soon, at the present rate, overtake the possible supply from the reservoirs now built, to enlarge which will entail heavy expense. It is also true that where there is not a strict accountability, large quantities of water are allowed to run to waste. From both these considerations the city authorities appear to be determined to adhere to their present scale of charges, a course which is leading many to adopt the driven well as a source of water supply. Its use has already become extensive in this city, and not only here, but all over the country, this mode of obtaining water is now being resorted to more than ever before.

With the different patents covering this method of water supply we do not now propose to speak. There are 150 patents on what is called the "point," or the bottom piece at the lower end of the tubing, into which the water first enters from the ground; as the result of the work of so many minds it would naturally be expected that something tolerably near perfection had been obtained, and it seems as though the one now generally being put down in New York meets all the requirements for such work. It is of heavy galvanized iron, about two and a half feet long, with small holes at regular distances on several sides, these holes being in hollows of the iron made by a sort of ribbed work, and around the whole of this part of the point is a fine brass sieve or netting. The room for the water to flow in here at the starting point, at the bottom of the well, is many times the capacity of the tube above, and the openings are so well protected that it must be very difficult, and is said to be impossible, for anything to get in the pipes which would prevent the regular flow of the water. Tubes with two inches inside diameter are very largely used, the tubes being generally made of wrought iron. The amount of water which one well will afford varies widely, as high as forty gallons per minute having been obtained in some places, and as low as ten gallons a minute in other localities. There is an abundance of water to be had over a large section of Manhattan Island at a distance of from thirty to eighty feet below the surface. The quality of the water obtained varies in different places, but it is generally only necessary to go low enough to get clear, pure water, for, by this system of making a well, the tube may be driven entirely through one stratum of earth furnishing an inferior quality of water, until a different stratum is reached which will give water as pure as desired, when the supply is drawn only from the latter source. As this water, however, has the general properties of nearly all well water, it is not always the best kind to use in steam boilers, and where it is so used, a chemical composition should be added to prevent the injurious effects which have been experienced from its continued use for this purpose.

The cost of these wells, as they are covered by patents, is fixed according to the supply of water required, on the principle that the wells shall be put down for the amount which one year's supply of water would cost from the city *i.e.*, the city's charges are based on the general rate of two cents for one hundred gallons—then for a manufacturer requiring 6,000 gallons a day, the cost of Croton water, counting 300 working days in a year, would amount to $360, and for this sum, or a little less than that proportionately where the supply needed is very large, one or more wells are put down sufficient to give the required quantity. So far there have been but few instances of any trouble in obtaining a regular supply after the wells have once been properly put down, and many wells and gangs of wells have now been in operation eight years, with no apparent change in the flow or the quality of the water.

FERDINAND DE LESSEPS AND THE CHAGRES CANAL.

The Viscount Ferdinand de Lesseps, with his family and staff of engineers, arrived in this city Feb. 25, from Panama, where he had been to examine the route of the proposed Chagres Canal.

Born in Versailles, France, Nov. 19, 1805, M. de Lesseps early entered the diplomatic service of his country, continuing therein some forty years. In 1854, he went to Egypt on the invitation of the Viceroy, Said Pasha, to examine the project for a ship canal across the Isthmus of Suez, and two years later he published a memorial giving full details of the enterprise. A stock company for the construction of the canal was formed, and M. de Lesseps gave himself up entirely to the prosecution of the great undertaking. The work was begun in 1859, and completed in 1869. This great achievement, conceived and carried out in spite of gigantic physical, financial, and political difficulties and discouragements, gave M. de Lesseps undisputed rank as the first engineer of the age.

Since the completion of the Suez Canal M. de Lesseps has suggested or has been consulted with regard to several great geographical and speculative enterprises—among them the conversion of a large area of the Sahara desert into an inland sea; the cutting of a ship canal through the Isthmus of Corinth, which is now being excavated; and the laying out of an elaborate scheme of Russian railways connecting the south and east of Europe with India. All these projects, however, are of comparatively small importance beside that of severing the Isthmus of Panama by means of a salt water ship canal at sea level.

With the history of this enterprise, since the Canal Congress in Paris last spring, the readers of the SCIENTIFIC AMERICAN are already familiar. M. de Lesseps says that as early as 1869 he was convinced that a sea-level canal without locks was the only one practically possible for the Isthmus; and at a public meeting in Paris, in 1870, he confidently asserted that opinion. This, however, it is proper to remember, was purely a matter of theory, for at that time there had been no careful survey of a route for a canal without locks, and accurate estimates of the practicability or probable cost of such a work were out of the question.

Having gone to the Isthmus determined to demonstrate the wisdom of his choice, M. de Lesseps has naturally succeeded in finding confirmation of the justness of his *à priori* belief.

The proposed canal substantially follows the route of the Panama railroad. A tide-lock is to be constructed in the Bay of Panama to control the level of the canal. In the Bay of Limon, on the Atlantic side, it is necessary to construct a breakwater two kilometers long, on account of storms. The cost of the entire work, estimated at 843,000,000 francs, includes the following items: All excavations, dredging, and removal of earth, 570,000,000 francs; dam at Gamboa, 100,000,000 francs; changing the waters of the Chagres, Obispo, and Trinidad, 75,000,000 francs; tide-lock on the Pacific, 12,000,000 francs, and breakwater on the Atlantic coast, 10,000,000 francs. Contingencies are estimated at 76,000,000 francs. The work will take eight years to complete, and it may be commenced before next June. The estimates contemplate the removal of 75,000,000 square meters of rock and soil.

The Gamboa dam will be required to form an artificial lake to receive and regulate the flow of the waters of the three rivers, whose periodical floods furnish the most serious danger to the proposed canal. This dam will be 5,000 feet long and 40 meters high. It will be exceeded in size only by the three great dams at St. Etienne, France, La Gemappe, Belgium, and Alicante, Spain. The last has stood for three hundred years.

At a reception given to M. de Lesseps by the American Society of Civil Engineers, Feb. 26, the distinguished engineer insisted that the proposed Chagres Canal was a much less difficult task than the canal at Suez. The deepest cutting would have to be about the height of the Brooklyn bridge towers. One of the visiting engineers, M. Douzat, said there would be seven miles of deep cutting, averaging 180 feet, of which 160 was rocks. The deepest cutting in other parts of the canal would average 40 to 45 feet. The entire length of the canal is about 45 miles. In answer to the question why a sea-level canal was preferred to one with locks, M. de Lesseps said:

"If the Commission of Engineers which had gone down to Panama had reported in favor of a canal with locks, I should have put on my hat and left the whole project and would have had nothing to do with it. That plan will do for small ships, but when we have vessels now afloat 500 feet long, and others on the stocks 600 feet long, it is impossible to say for what you would have to build locks. Single locks would be slow, and double locks, though quicker, would be very expensive and require constant repairs. At Nicaragua they intended the use of locks, and with the earthquakes which prevail there the repairs would be ruinously expensive, and even at Panama, where earthquakes do not exist, they would be fatal by reason of the loss of time. I would not have anything to do with a locked canal except for little ships. It is not the proper idea for a grand interoceanic canal."

M. de Lesseps is a man of medium height, strongly built, alert in all his movements, erect and elastic in carriage, and seemingly not much over fifty years of age, though really seventy-four. His first days in New York have been devoted to the inspection of the elevated railways, the Brooklyn Bridge, the working of the fire department and the Croton water service.

Loiseau Compressed Fuel.

At the last session of the American Institute of Mining Engineers, held in this city, a paper was read by E. F. Loiseau on "The Successful Manufacture of Pressed Fuel at Port Richmond, Philadelphia." A huge fire in the grate gave evidence of the qualities of this fuel, specimens of which in egg-shaped lumps were examined with interest. The fire was started without the use of kindling wood. The paper explained the process of manufacture, the difficulties encountered, and the measures adopted to obviate them. The elements of this fuel are 91 per cent of coal dust and 9 per cent of pitch, the latter being used to cement the coal dust.

The fuel lasts as long as ordinary anthracite, and does not produce clinkers. Thirteen tons of it are now produced each hour. Reference was made to the difficulty of obtaining a supply of coal dust, as the coal men were not inclined to supply the means of making a fuel to compete with coal. But confidence was expressed that it would soon appear to the advantage of coal men to erect machines for the manufacture of the pressed fuel and make it a leading industry.—*Coal Trade Journal.*

[We have used Mr. Loiseau's pressed fuel in an open grate at our residence, and can add our testimony as to its cleanliness, heat giving and lasting qualities.—ED.]

Land Slide in Fraser River.

A notable disaster occurred in the fore part of February at a place called Maple Ridge, some twelve miles above New Westminster, British Columbia. At that point the Fraser River is a quarter of a mile wide; the south bank about ten feet high, the north bank rising to a bluff of over a hundred feet. Suddenly one afternoon some acres of the highest part of the bluff slid into the river, where it was about fifty feet deep. The breadth of the river was reduced a half, and the rush of earth threw up a wave which flooded for miles the level country opposite the bluff, doing much damage. The river at the place where the land slide occurred presents a strange appearance. Rising from two to ten feet above the surface of the water are trees standing at different angles, some of them as straight as when they stood on the high bank, and others leaning and partly covered with earth. The tract that went into the river was in shape like a half moon. The new bank reveals reddish, light earth for about twelve feet from the top, under which is a stratum of blue clay some twenty feet thick, and all the earth below that, so far as it is visible, is a mixture of coarse gravel and sand. There are large cracks along the bank, extending inland for 150 feet or more. The impression is that still more of the bank will go into the river.

Leading American Industries.

Already more than thirty of our largest manufacturing establishments, illustrating as many different industries, have been published in these columns during the past year. Our artists are now engaged preparing full page engravings, of several other manufacturing works, which will appear in forthcoming issues. It is our purpose to continue the publication of this series of mechanical subjects until every leading industry of the country has been illustrated and described. This feature of the paper has proved very acceptable to our readers and gained for it many new patrons.

New subscribers and others desiring copies of any of the thirty three numbers containing full page illustrations of as many different manufacturing establishments, can be supplied by addressing this office. Price 10 cents a copy by mail.

Snow Eating Unhealthy.

A writer in the *Phrenological Journal* admonishes parents to guard their children from the practice of snow eating, claiming that it has much to do with head colds of many girls and boys, because of the chilling effect of snow upon the palate or thin partition between the mouth and nostrils producing congestion in the fine membrane which lines its upper surface. As this membrane is almost entirely constituted of delicate nerves and blood vessels, inflammation is likely to follow the congestion, and perhaps degenerating into nasal catarrh, an affection so common with persons in our northern latitude.

Back Numbers and Volumes.

Subscribers to the SCIENTIFIC AMERICAN will be entered on our books to commence at the date the order is received: but those desiring the back numbers to the commencement of the year will be supplied on their signifying a wish to have them. Last year's volumes may be had in sheets by mail at regular subscription price, namely, $3.20.

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A NEW FRUIT DRIER.

A compact and portable fruit drier, adapted to the wants of farmers and others desiring to produce a good article of dried fruit, is shown in the annexed engraving. The inventor informs us that the device dries apples in a few hours, delivering the fruit white and clean, with all the flavor retained, so that it resembles in all respects the article sold as evaporated fruit.

The case, A, has a number of openings in its front side, for a series of movable drawers for containing the fruit to be dried. The case has a furnace chamber, B, in which is placed a movable sheet iron furnace having a cast iron bottom provided with a handle, *j'*. The upper part of the furnace sets loosely on the bottom, and is easily removed to facilitate the discharge of ashes. Charcoal or coke makes the best fuel, but coal from the kitchen fire may be used if the bituminous matter is permitted to burn out first.

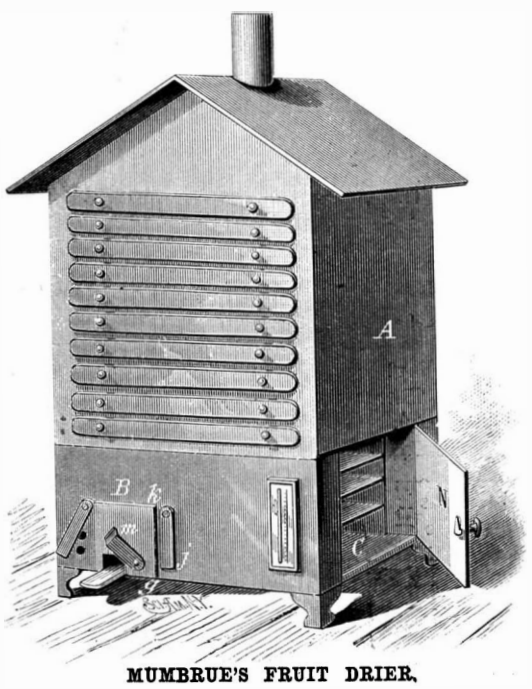
The draught of the furnace is regulated by the damper, *m*, and the admission of air to the furnace chamber is controlled by dampers, *j*.

A purifying chamber, C, separated from the furnace chamber by a perforated partition, has shelves or trays containing absorbents by which impurities are removed from the gas and hot air that proceed from the furnace chamber. From the purifying chamber the hot air and gases are drawn upward over and under the several fruit-containing drawers in alternation, and are finally discharged through the flue at the top, carrying with them the moisture from the fruit.

The temperature of the air in the purifying chamber is indicated by the thermometer seen at the right, and the draught may be regulated to give any required temperature

The drier shown in the engraving is thirty-six by twenty inches, and the drawers, ten in number, are about three fourths of an inch deep. Such a drier will contain about two bushels of fruit.

The device may be made small and portable, or it may be adapted to a fixed building.



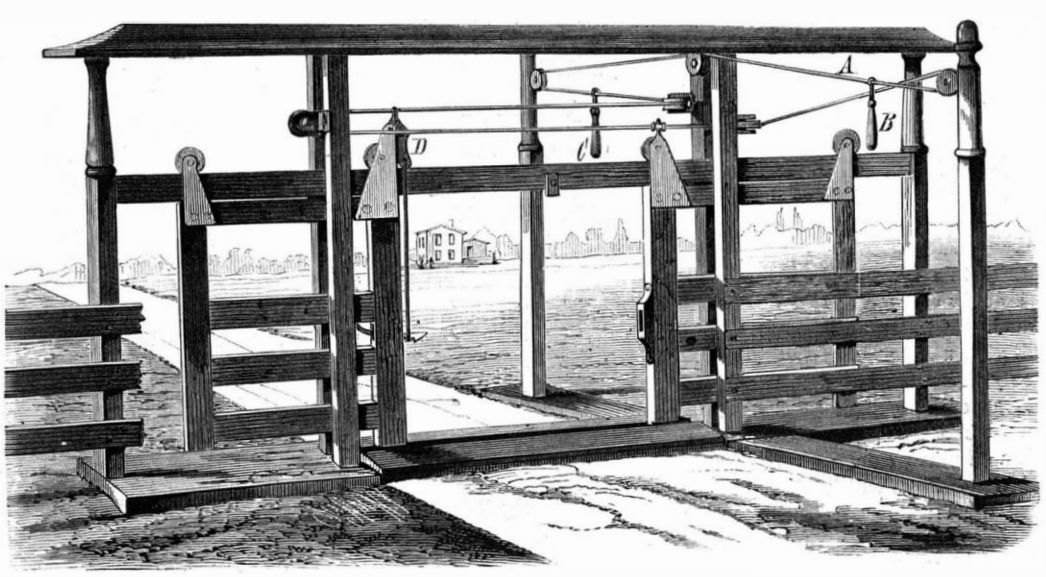
MUMBRUE'S FRUIT DRIER.

This fruit drier is the invention of Mr. William B. Mumbrue, of Montour, Iowa.

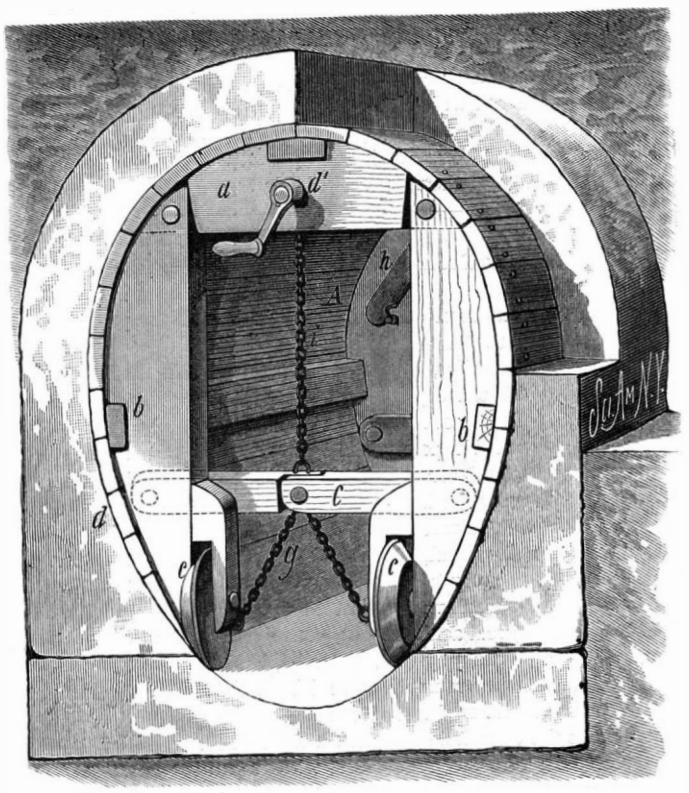
IMPROVED ROLLER GATE.

The annexed engraving represents an improved apparatus for operating roller gates, recently patented by Mr. Henry Allen, of Silverton, Oregon. The invention consists in the application of an endless chain or rope to a double or single roller gate, the rope being provided with handles and conveniently arranged so that the gate may be opened by pulling the rope in one direction, and closed by pulling it in the other direction.

The engraving shows the application of this device to a double rolling gate, but it may be applied with equal advantage to a single one. The gates run on a horizontal bar supported by posts which also support a protective covering. Two posts, set up on opposite sides of the gate, and equally distant from it, support pulleys around which passes the endless rope, A, which also passes around two pulleys on one of the gate posts and one pulley on the opposite post, bringing two strands of the rope above the gates in a horizontal position. The lower strand has a strong loop through which passes an arm projecting upward from one part of the gate. This loop is of sufficient length to admit of moving the rope a short distance without moving the gate. The upper strand of rope is connected with the other part of the gate by a three-armed lever, D, which is pivoted to an arm projecting upward from the gate. The lever, D, is connected with the gate latch, and the first operation on pulling the rope is to unfasten the gates; a further movement of the rope opens the gate. A person in a carriage or upon horseback may readily open the gate by grasping the handle, B, and drawing it along as he proceeds. After passing through the gate the handle, C, is grasped and the gate is closed. The operation of the gate is the same whether approached from one direction or the other.



ALLEN'S IMPROVED GATE.



BURNS' MOULD FOR SEWER BUILDING.

IMPROVED MOULD FOR SEWER BUILDING.

The annexed engraving represents an improved mould or centering, used in sewer building, and is adapted to any of the sewer building materials in common use, such as concrete, artificial stone, or brick, and is made of convenient length and of the proper form for a sewer, and is mounted on wheels and made collapsible, so that after a section of sewer is built it may be contracted and moved into a convenient position for building another section.

The frame of the mould consists of a top cross rib, *a*, at each end, to which are pivoted vertical side ribs, *b b*, having their lower ends connected by toggle bars, *c*, which retain and brace the ribs, *b*, when the mould is expanded. The ribs, *a b*, are covered by a sheathing, *d*, of wooden slats or sheet metal, except at the bottom, which is left open. Extending lengthwise through the mould, and sustained by ribs, *a*, there is a shaft, *d'*, from which chains or ropes, *i*, extend to the jointed bars, *c*. The shaft, *d'*, project beyond the ends of the mould, and is provided with crank handles, by which it can be turned to wind the chain, and thereby draw the sides of the mould inward.

The mould is supported on wheels, *e*, fitted in supports at the lower ends of the side ribs. These wheels facilitate the labor of shifting the mould as the work progresses.

In building sewers with this mould, a bottom or base, of stone or concrete, is first laid in the trench at the required grade, and when this is set the mould is placed thereon and the sides and crown of the sewer formed around it. A head is attached to the end of the mould by screws or other fastenings, and projects as a flange, serving as a gauge for the thickness of the wall. When the section is completed the head may be removed and the shaft, *d'*, turned to draw the sides of the mould inward. This action allows the mould to drop down, so that the sides and crown are relieved, and the mould may be then drawn out to the position required for the next section, and expanded by relieving the chain.

Springs, *g*, attached to the bars, *c*, and ribs, *b*, tend to draw bars, *c*, downward and expand the mould. There are also braces, *h*, hung on the ribs, *a*, which, when the mould is collapsed, catch on pins in side ribs, *b*, giving rigidity to the mould while it is being withdrawn.

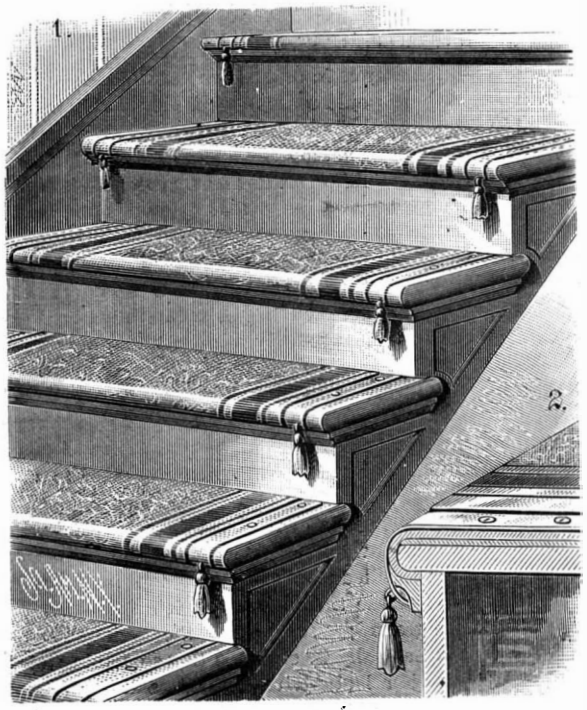
To prevent the sides of the mould from being forced inward when the sides of the sewer are rammed, the joint of the bars *c*, are fitted to drop slightly below the center line when the sides are expanded, and the springs, *g*, aid in accomplishing the same object. By the use of this mould a sewer may be built rapidly to any grade, with top and sides of uniform thickness, without joints, and with a smooth interior surface. The trench may be filled as the work progresses up to the crown of the sewer, and the side walls thus strengthened while the material is setting.

This invention was recently patented by Mr. James Burns, of San Antonio, Texas.

POODLE MOTORS.—At the recent Applied Science Exhibition, Paris, M. Richard, a clothier, exhibited a motor which was turned by a poodle dog, confined in a revolving cage. The dog was able to drive four sewing machines. Women who have heretofore been accustomed to support their poodle dogs in idleness may now make them useful.

NOVEL METHOD OF CARPETING STAIRS.

We give herewith an engraving of a new method of carpeting stairs recently patented by Mr. T. F. Walter, S. E. corner 20th and Brown streets, Philadelphia, Pa. Instead of a continuous carpet extending from the top to the bottom of the stairs in the usual way, each step is provided with its own carpet, which may be put on or taken off independently of the other steps. These sections of carpet are secured to the steps at the rear by tacks, and at the front by the moulding under the nosing. A band of brass or other metal, either plain, ornamented, nickeled, gilded, or enameled, extends across the ends of the carpet, and curving over the nosing is furnished with a metallic pendant.



WALTER'S METHOD OF CARPETING STAIRS.

Stairs carpeted in this way present an elegant appearance, and accord with the modern style of house furnishing. The carpeting is adapted to stairs of all widths, and little more than half the usual quantity of carpeting is required. The rods, while costing less than the ordinary styles, are much more ornamental and secure. There are several other advantages in this style of carpeting which will be apparent to those interested in this subject, not the least of which are the doing away with the use of covering to hide worn places that would otherwise appear when the carpet is moved up or down, and the facility with which any or all of the small pieces may be removed from the stairs and cleaned.

We call attention to Mr. Walter's advertisement in another column.

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A NOVEL SMALL MOTOR.

A small, safe, and easily managed motor adapted to domestic use and suitable for driving small machinery of various kinds is one of the things that has long been wanted, and we are pleased to be able to present to our readers several engravings of a motor of this description which is made by reliable parties and is now being extensively introduced.

The Tyson motor possesses some novel features which are well worthy of careful examination. It is a steam engine with a non-explosive steam generator, and without a steam gauge, water gauge, or safety valve, and its boiler or generator has but one-fiftieth the cubical capacity of an ordinary boiler adapted to the same engine.

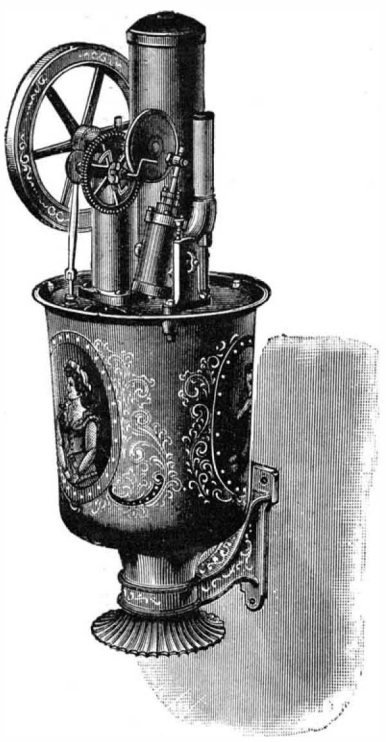


Fig. 6.—TYSON BRACKET ENGINE.

In the smaller sizes of these engines either gas, coal oil, or gasoline may be used as fuel, and for the larger sizes coal and wood may be added to the list.

The fact that this engine is perfectly safe, even in the hands of the inexperienced, is a great point in its favor. It may be run by any lady who is competent to operate a sewing machine. It is beautifully finished and may be placed in the parlor, sitting room, bed chamber, or kitchen, and may be employed in running sewing machines, knitting machines, ventilating fans, and all kinds of light machinery used about the house. It may also be used for running coffee mills, printing presses, dental lathes, in fact it may be applied to all machines usually driven by a treadle or hand. power.

The general appearance of this new motor is well represented in the central view in the larger engraving, while its application to small machinery is shown in the smaller views, Fig. 1 showing it in connection with a sewing machine, Fig. 2 shows a lathe, and Fig. 3 a scroll saw driven by it. Fig. 4 shows an application too obvious to need description, but it suggests the possibility of comfort in the sweltering days

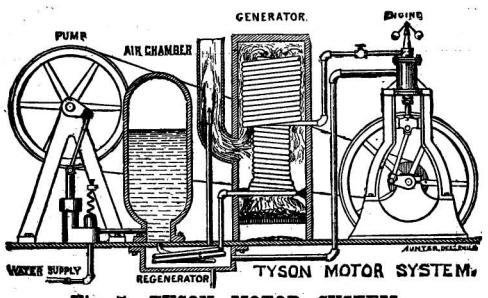


Fig. 7.—TYSON MOTOR SYSTEM.

of mid-summer. Of course the variety of machinery to which the motor may be applied is unlimited. The style of engine shown in the engraving has a power equivalent to 1,000 foot pounds per minute, and is quite sufficient for a great variety of purposes; but we are informed that larger sizes are soon to be made so as to cover a wider range of application.

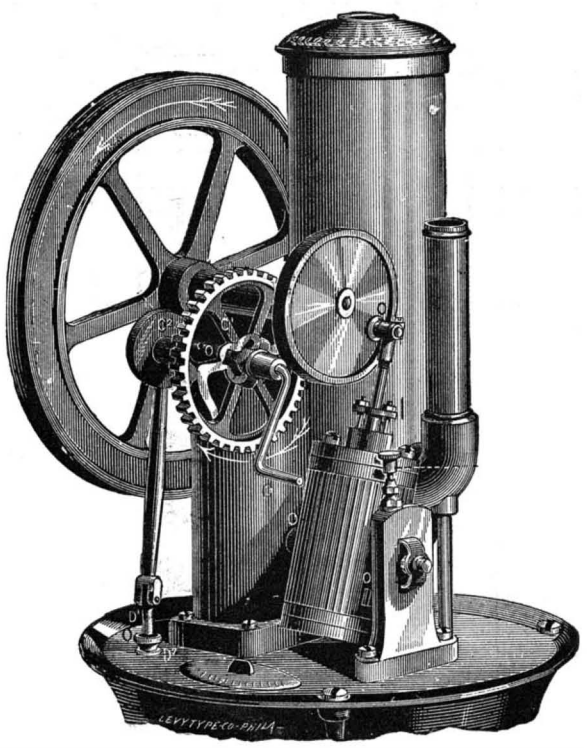


Fig. 5.—TOP OF TYSON MOTOR.

Fig. 5 is an enlarged view of the upper portion of the engine, showing the oscillating cylinder, the generator, and the pump. Figures 3 and 6 show the engine adapted to a wall bracket.

Fig. 7 shows the relation of the various parts of the engine, and illustrates the operation of the system. The pump is worked by hand to produce pressure in the air-chamber; this chamber is connected to the steam chest of the engine by means of a long pipe, part of which is coiled in a receptacle through which exhaust steam from the engine has egress, and part in a furnace. The water is converted* into steam, in its transit through this pipe, and steam is delivered to the engine at the pressure produced by the pump. When the engine is started it imparts motion to the pump, and the preinduced pressure is maintained; thus it will be seen that the function of the generator is to create volume, not pressure. Should the

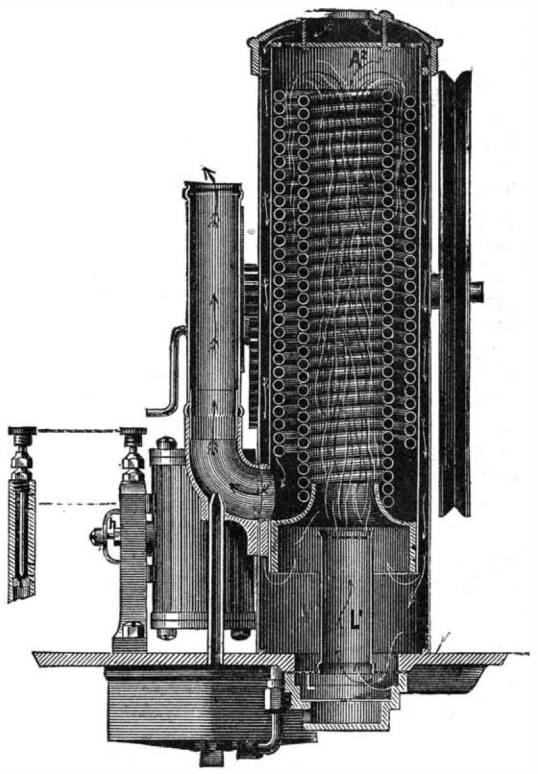
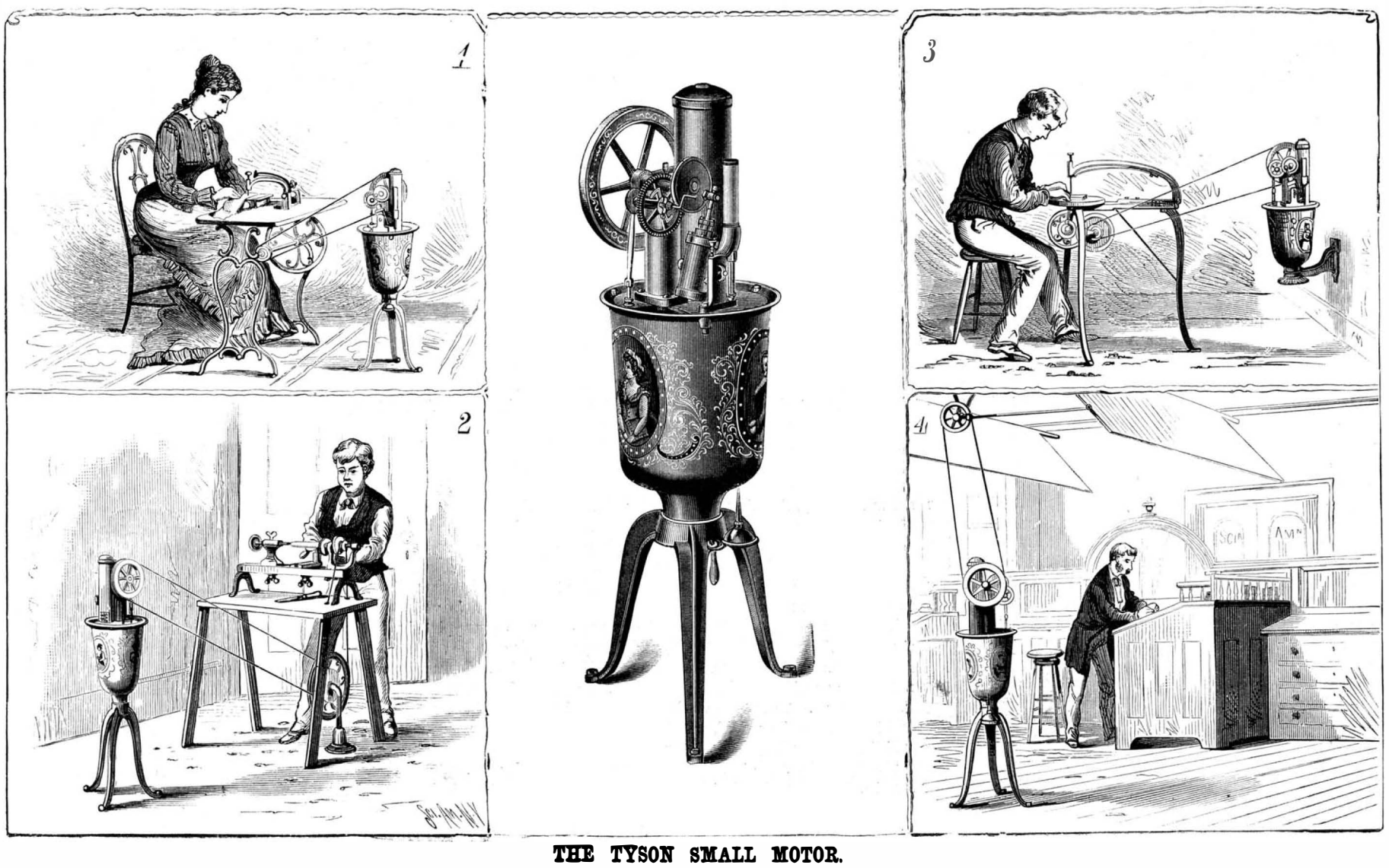


Fig. 8.—VERTICAL SECTION THROUGH GENERATOR.

engine be stopped and the fire continue to burn, the water in the coil is forced back to the air chamber, and the production of steam is thereby checked; the engine being again started, the pressure in the air chamber again forces water through the heated coil, and the generation of steam is resumed. In running these small machines about all that it is necessary to do is, to pour in a few quarts of water once in four or five hours. The construction is such that there can be no explosion even if the water becomes wholly exhausted. In that case the machine simply stops till water is supplied.

A relief valve at the right of pump limits the pressure; this valve is in no sense a safety valve, for even if it were

* The inventor states that in practice it is best to flash highly-heated water into steam.



THE TYSON SMALL MOTOR.

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fixed so as not to yield to pressure, no explosion could occur —the mechanism of the pump not being strong enough to produce a bursting pressure.

This engine is the invention of Mr. Charles Tyson, of Philadelphia, and it is now being manufactured in handsome styles and introduced by the Tyson Engine Company, 1301 Buttonwood street, Philadelphia, Pa., to whom all letters should be addressed.

New Type of Torpedo Boats.

The torpedo boats used in the English Navy are of two kinds—those of the Lightning class measuring 84 feet in length and 100 feet 10 inches in beam; and those of the second-class, 60 feet long by 7 feet 6 inches broad. It has, however, been found from experience that first-class torpedo craft of the dimensions hitherto constructed are not sufficiently seaworthy to go out in any weather, and many governments are, in consequence, adopting a larger size. Messrs. Yarrow & Company, of Poplar, are at the present time engaged in building several of the new type of torpedo boats for various governments, including those of Russia and the Argentine Republic. They are 100 feet in length by 12½ beam, and are intended to be capable of going to sea under all conditions of weather unattended by other vessels. Their fuel carrying capacity will be sufficient for a run of 1,000 miles. They are also built much stronger and heavier than has been hitherto the practice, and are expected to realize a speed of 19 knots.

New Steam Frigate.—The Largest in the World.

The following from the *Mechanics' Magazine* of about forty years since affords an interesting comparison with the dimensions of ships of to-day: "The Admiralty have given instructions for the building and equipment of a new steam frigate, which is to surpass, in size and power, every thing of the kind yet afloat. She is to be of 650 horse power; to have engine room for 600 tons of fuel; complete stowage under hatches for 1,000 troops, with four months' stores and provisions, exclusive of a crew of about 450 men; and is to be armed with 20 guns of the heaviest caliber, besides carronades. The Cyclops, Gorgon, Geyser, and other war steamers now talked of as wonders for magnitude, will sink into insignificance as compared with this; the largest of them will be little more than half her size. For the sake of greater expedition she is to be made out of one of the large class frigates lately built (the Penelope, cut in two, with 55 feet in length added). The originator of this plan is John Edye, Esq., the able assistant surveyor of the navy (well known to all naval architects for his invaluable work on the "Equipment, Displacement, etc., of Ships and Vessels of War"), and she is to be completed at Chatham Dockyard, under his immediate superintendence and direction. The engines are to be on the Gorgon plan, and the commission for building them has been given to the inventors of that plan, Messrs. John and Samuel Seward. The vessel is expected to be fully completed and ready for sea before the close of the present year.

"The conduct of the government in this matter—conduct alike admirable for its vigor and promptitude—is, under the existing circumstances of the country, of a nature to give very general satisfaction. By nothing can such disasters as have lately befallen our arms in the East be so effectually repaired, or their recurrence more certainly prevented than by the fitting out of a few such leviathans of war as that which we have now described as being in progress. With half a dozen ships of this force at command, 6,000 men might within three weeks from the first receipt of the news from Afghanistan have been landed at Alexandria, marched in six days through Egypt (with leave of its Viceroy) to Cosseir, on the Red Sea, and transported thence in nine days more to Kurruckee, on the south coast of Scinde. With such a force there is hardly a corner of the world which British thunder could not reach in early time enough to uphold, against all opposition, British influence when linked in honorable alliance with the interests of human civilization and happiness (may we never know any other!). It is, moreover, a simple mechanical fact, which admits of no denial, that Great Britain can show forth a power in this way (thanks to her mechanics! thanks to her workshops! thanks to her practical science!) which no other country in the world can at all approach, far less rival. Every year, for the last half dozen, has witnessed some paper decree for the formation of a French steam navy, with engines of 300, 400, and 500 horse power, but where are they? It is notorious that all France has never yet been able to produce an engine, good for anything, of more than 200 horse power. Were such an order, as has been just given by our Admiralty for a pair of 325 horse power each, to be furnished in nine months, to be given by the French Government to French manufacturers it could not be executed (if at all) in as many years."

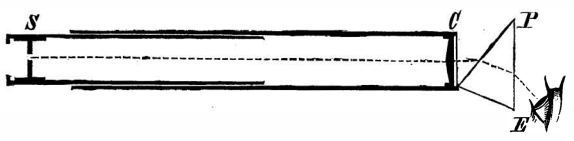
ITALIAN PRIZES FOR AMERICAN VINES.—The London *Times* reports that the Italian Government has offered three prizes, amounting to $1,800, for vines raised from grafts of American varieties of grapevines capable of resisting phylloxera.

MILLER OIL CAN PATENT.—The House Committee on Patents agreed, Feb. 24, to report favorably to the House the bill extending the patent of Henry Miller on oil cans.

CHEAP SPECTROSCOPE.

The Fraunhofer lines in the solar spectrum, and some of the bright-line spectra, can be seen by the aid of the following simple arrangemen

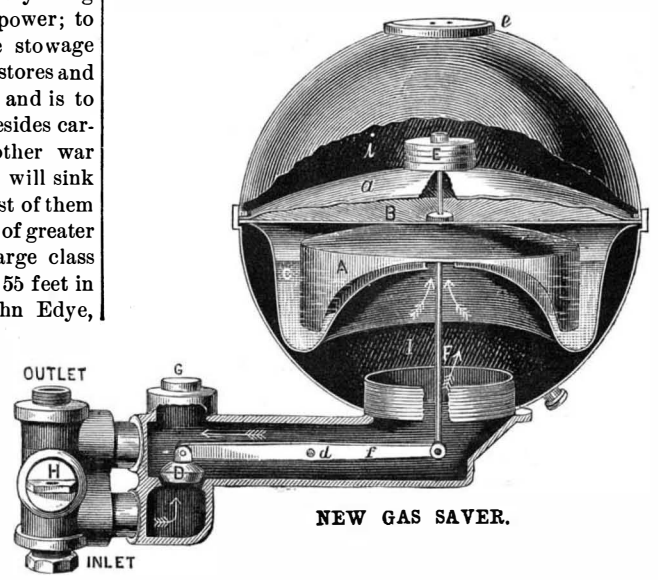
Make the slit in a piece of thin (very thin) sheet copper,



by laying it on a smooth surface—a planed deal board, say —and cutting the slit with the aid of an old sharp knife and a hammer. Get a piece of tubing with a shorter piece sliding in it to carry the slit, S, in the figure. The collimating lens, C, may be about 8 inches focus, and is placed its focal length away from the slit. A prism, such as may be bought for 50 or 75 cents at the optician's, held at P, will show a spectrum to the eye at E.

NEW GAS SAVER.

One of the difficulties connected with gas illumination is that the pressure in the mains varies considerably in different parts of a town or city, and at different hours of the day and night, consequently a system of lighting, adapted for a part of a town situated in a low level, will show inferior results in a more elevated situation. A rise of ten feet gives, roughly, a tenth of an inch of increase of pressure, as indicated by the manometer, so that it may easily happen that in the same town or city the pressure in one place may be one inch, while in another it may be two and a half inches. Again, the pressure of the gas, as sent out from the gas works, varies from time to time, in accordance with the quantity consumed, and as public works, shops, etc., are suddenly lit up or extinguished at certain hours, private consumers are annoyed, in the one case by falling off in the amount of light, and in the other by a flaring flame and hissing sound; and, besides this, for every increase of pressure there is an increase of consumption without an equivalent increase of light.



NEW GAS SAVER.

The annexed engraving represents an instrument designed to obviate these difficulties. In this device a diaphragm is used, but it is not subject to deterioration, as in other forms of regulator, as it is protected from contact with the gas by a strong metallic shield; between the diaphragm and the gas there is at all times pure atmospheric air. This is an improved and most important feature, which, the inventor informs us, is entirely new in this class of inventions. The valve is perfectly balanced, and operates so that no matter how great or variable the pressure may be, it cannot operate on the surface of the valve. This arrangement obviates the necessity of putting on and taking off weights. The main mechanism is contained in a spherical copper case, connected to a hollow arm or casting at the bottom. At the end of the casting there is an inlet and an outlet, arranged for connecting a by-pass cock, H. The edges of a float, A, dip into the well or trap, C. This well or trap is primed with glycerine, a fluid that is neither volatile nor affected by heat or any degree of cold, and will never require changing. It prevents the gas from coming in contact with the diaphragm, and insures a perpetual seal around the cup, A. Across the center of the case there is a diaphragm, B, which prevents the glycerine from being displaced by the pressure of the gas, also prevents spilling of glycerine by accident. This peculiar formation of the glycerine holder or trap renders the moderator transportable to any distance and in any position.

When the by-pass cock is closed the gas will pass over the valve, D, and fill chamber, I, and the space under cup, A, as shown by the arrows. The cup, A, diaphragm B, and rod, F, are equally balanced by the valve, D, on the fulcrum, *d*, and lever, *f*. The pressure of the gas will raise the cup, A, and in doing so the rod, F, will be lifted, when the lever, *f*, will throw the valve, D, down on its seat.

To adjust the valve to the proper rate of pressure for gas, small weights are placed at E. When one burner is opened the cup, A, drops and opens the valve and lets out of the gas meter just enough gas for that one, and at a rate of pressure from which all the light is derived from gas, and so on for every burner that is opened. If one burner is closed the cup, A, rises, causing the valve, D, to close also, and so on for every burner that is closed.

If the pressure from the gas works increases while using one or more burners, the valve, D, drops and retards the flow of gas. If the pressure goes down at the works, the valve, D, opens and lets out more gas. This device is, in fact, a self-acting valve on the meter or mains, and the inventor claims that no amount of personal watching can equal this simple device.

By opening the by-pass cock the gas will go direct to the burners without being operated upon by the moderator.

The inventor of this instrument is Mr. J. S. de Palos, of Room 34, No. 206 Broadway, New York.

The Leyden Jar.

Mr. E. H. Gordon delivered lately a lecture at the London Institution on "The Leyden Jar." The lecturer proposed to tell his hearers something about this important portion of electrical apparatus, that they might see whether the study of its phenomena might not shed some welcome light on the way in which electrical forces acted in the great field of nature. The invention was arrived at accidentally, in 1746, by a Leyden University student, named Cuneus, who was trying to electrify water, and in the course of the experiment, having first unconsciously made himself part and parcel of a reservoir full of stored-up electricity, afterwards converted his body no less innocently into a discharging rod. The shock he got was so smart as to force from him the exclamation that not for the whole kingdom of France would he expose himself to such another. Subsequent investigation led to some clearing up of the phenomena and to the devising of safe arrangements for slowly filling a glass vessel with the electric fluid and emptying it in an instant at will. The common Leyden jar was described and its action shown and elucidated. Experiments followed with a greatly improved apparatus, which was no sooner filled with electricity than the fluid instantly overflowed like water, but in intensely vivid and loudly crackling sparks. Yet, as was experimentally demonstrated, there was no continuous stream, but only an aggregate of so many jarfuls. Moreover, the electric fluid, unlike water, could be made to fill the jar by pouring it outside. It was thus clear that the electricity acted in some way through the glass, which used to be regarded as an absolute non-conductor interposed between the two conducting surfaces, the outside and inside coatings of tin foil. The question in this, as in other instances, was one of more or less resistance to the electric strain, which many experiments proved to be very analogous to mechanical force. It was shown that in proportion as glass was heated the resistance was lessened, and other experiments illustrated the perforation of even very thick plate glass by concentrating upon one point the strain of the electric spark. Of course, the thinner the glass the more easily was it pierced. In like manner, the more rarefied the stratum of atmospheric air, the more readily did it transmit electric discharges. The experiment of the aurora tube was one of those performed in illustration of these statements.

An important phenomenon in connection with the Leyden jar was the so-called "residual charge," which a faint spark showed to have collected a few minutes after the discharging rod had done its part in emptying the reservoir. This was compared with the residual recoil of an elastic body which had been bent, but which needed a second effort in resuming its original position. What was more, Professor Ayrton's experiments on this problem, which were not only unpublished as yet, but had not even been laid before the Royal Society, proved that the phenomena in the two cases were the same in degree as well as in kind. The researches of Dr. J. Hopkinson, F.R.S., authorized the conclusion that the electric strain which spanned the cosmical spaces, as in the instance of the magnetic storms caused by sunspots and disturbing our electrometers, was as mechanical in its action as that transmitted through short distances, and which was quite under our own control. Lastly, the late Professor Clerk-Maxwell had mathematically demonstrated that the ether which fills all space was the identical medium which transmits electrical forces from the sun to the earth.

Submarine Communication with Australia.

About two years ago the Australian colonies expressed a desire for the duplication of the telegraph cable then existing between India and Australia. The Eastern Extension Telegraph Company (to whom the cable belonged) therefore sent out its managing director, Colonel Glover, R.E., who negotiated with the various colonies on the spot, and agreed, on behalf of the company, to lay a second cable in consideration of the payment by the colonies of a subsidy of £32,400 per annum for a period of 20 years. This agreement was ratified and signed in London on the 6th of May last, and it was then stipulated that the work should be completed within a period of eight months.

Subsequently, after a great portion of the cable had been manufactured, the Imperial Government became desirous of establishing telegraphic communication with its South African colonies, and entered into negotiations with Mr. Pender, who, with his usual energy, undertook to carry out their wishes. As it was of great importance that the utmost expedition should be used, application was made to the Australian colonies to allow this portion of their cable to be diverted for this purpose. This was agreed to, and the consequence was that the whole of the telegraph cable between Aden and Natal, a distance of 3,838 miles, was completed in December

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last, thus bringing South Africa into telegraphic communication with England. When acceding to this diversion the Australian Governments liberally allowed an extension of two months to the time originally fixed for the completion of their duplicate cable, thus bringing it down to the end of February next.

We have now to announce that the duplicate Australian cable has been completed, and is open for traffic, thus anticipating the contract time by more than a month. The new cable takes a somewhat different route to the original. The old cable from Singapore landed at Batavia, and the messages were sent over the Dutch Government lines to Banjoewangie, at the furthest extremity of Java, where the Australian section of the cable commences. By the new arrangement the Singapore section is taken direct to Banjoewangie, thereby avoiding the Java land lines, which will effect a great saving of time and tend to greater accuracy, as the messages will pass entirely through English hands.

It will, therefore, be seen that during the last ten months the above mentioned cables, aggregating about 6,400 miles in length, have been manufactured and laid. This work has been carried out without a single drawback or difficulty arising, the credit of which is due to the perfect organization and resources of the Telegraph Construction Company, who have manufactured and laid the whole of these cables within this limited period.—*London Times.*

AMERICAN INDUSTRIES, No. 34.

[*Continued from first page.*]

use; (3) it was not subjected to sufficient strain to impair its accuracy, and (4) the pressure was borne by the end of the pitman, and not by the pin. These improvements, with a solid frame for the press, of which the bearings for the slide became a part, so materially enlarged the field in which the power press might be practically employed, that the demand for presses rapidly increased as new uses for such machines were continually found.

The manufacture of power drop hammers is also an important branch of business carried on by the Stiles & Parker Company, and the improvements which have been made in drop hammers have been almost contemporaneous with those effected in the power press. At first the drop hammer was simply a weight with a rope therefrom running over a single pulley. An early patent provided for attaching the hammer by a strap to a crank, in which were pin holes by which the height of the rise of the hammer was regulated. This was succeeded in 1863 by the friction roll drop hammer, in which the hammer was made to fall, at the will of the operator, from any height, or automatically from a given height, so as to give either a light or heavy blow as desired. Mr. Stiles has since improved upon this machine, so that the automatic and voluntary adjustment are now combined, and a uniform, an occasionally varied, or a constantly varied blow may be given at the will of the operator, and the machine is as perfectly under the control of the workman as is the hammer in the hands of the blacksmith.

The multiplicity of uses to which these improved presses and dies are now put for the saving of hand labor in forging, planing, filing, drilling, etc., it is difficult to enumerate, as there is hardly a manufacture in the country to which one or the other of them is not related, either for making the finished article or forming the machinery with which it is made. The watch-making industry, as is well known, has been revolutionized by this machinery, and there is hardly a part of a watch which is not now made by a press or a drop, or both. They have likewise caused a revolution in the manufacture of firearms, and the great precision of our modern weapons as well as their cheapness is due to the use of such machines. They are also largely used in the manufacture of tin, silver, copper, britannia, and brass ware, clock cases, locks, sewing machines, etc. Almost every description of metal cutting, trimming, punching, drawing, shaping, stamping, and forging comes within the sphere of their operation, and it is stated that of presses manufactured by this company there are over 5,000 in use in this country.

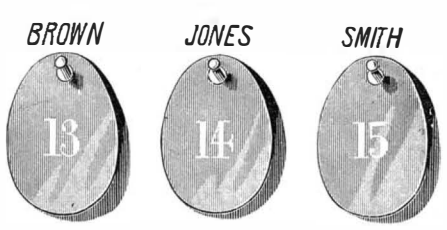
Among the work recently completed by the company are a press for making eyelets, which is calculated to turn out 8,000 a minute; a drawing press which will, at one operation, draw up clock cases 12 inches in diameter and 4 inches deep, using a blank of brass 16 inches in diameter; a press weighing 12,000 pounds, capable of punching 1 inch hole through 1 inch iron 25 inches from the edge of the sheet; a 1,000 pound drop hammer for a Connecticut firm; also a 200 pound drop for the Russian Government, this being the second one made for that government. The capacity of the establishment is being tested to the utmost by the number of orders now in hand. Among the work in progress is a large size double-acting drawing press, and a punching press to make 21,920 holes a minute, ¼ inch diameter, through iron $\frac{1}{16}$ inch thick, the press being calculated to make 80 strokes a minute, and 274 holes to a stroke, the feed being automatic. This press will weigh four tons, and they are making another somewhat similar which will weigh seven tons. Large and powerful as these presses are, however, they do not compare with one which the company has lately been asked to make, and the feasibility of which they are now considering, viz., a press which will make, at one time, 120 ⅝ inch holes through $\frac{5}{16}$ inch boiler iron. This is considerably beyond the capacity of any press yet made, and while the proposition marks the extreme of present development in the press manufacture, the fact that it is entertained indicates yet greater possibilities for the future.

In the engraving on the first page of this paper the group of buildings in which the business of the company is carried on is represented in one of the views. The building at the right is the foundry, which now has but one cupola, but another is in course of construction. Here is done all the casting required, and the amount of metal run usually varies between two and five tons a day. To the left of the foundry is the main building, the whole of the ground floor of which is occupied as a general machine shop, the second floor being used for making dies and patterns and as a tool room, while the top floor is filled with patterns, the accumulations of many years' work on a wide variety of machinery. To the left of the main building is the blacksmith shop and forging department, and in the rear, connecting with the main building and with the blacksmith shop, is the engine and boiler room.

In the right of the foreground of the main room, as shown in the large illustration at the bottom, is a drop anvil, the base for a drop hammer in course of construction, the upright parts of which are lying at its side. To the left of this may be seen mounted on a box, its stand not yet having been supplied, a shearing press for cutting tin, which, by an automatic fixture, throws the good blanks in one box and the scrap in another. To the rear of these, and in the center, are large punching and perforating presses nearly completed, while on both sides of the room extend lathes, planers, milling machines, etc. Some of the lathes here are of extraordinary length, for use in making shafting, while one has a capability for taking unusually wide and heavy pieces.

In the blacksmith shop, as shown in the upper right hand engraving, is a steam hammer, capable of striking a blow of 10 tons for very heavy work, and a power drop hammer for general forging. This department is conveniently arranged, and is fitted up for doing forging of almost every kind, large and small.

In the tool room, as shown in the upper left hand view, is a gear cutter, which will cut any size gear from 1 to 60 inches. Here also are milling and die sinking machines and tool makers' lathes, but the principal interest attaching to this department is in the system adopted by Mr. Stiles several years ago, of checking every workman with the tools taken by him to use in any part of the works, such check to remain against the workman until the tool is returned. As this system, or something on the same principle, has since been adopted in many other large machine shops, we herewith illustrate the plan originally started by Mr. Stiles. All the workmen who may require tools are numbered, and their names and numbers put in a rack in the tool department, with, under each man's name and number, a number of metal tags, as follows:



When a workman requires a tool from the tool room, one of the metal tags on the hook under his name is put in the tool rack in place of the tool, and there remains until the tool is returned, when the tag is again placed on its hook beneath the man's name. The number of tools out, and who has them, can thus be seen at a glance. An effectual check is thus put upon the carelessness of workmen, who might leave tools lying around after they were through with them. This, however, is only one feature of a complete system which marks the conduct of the business in every department. Each room has a competent foreman. Mr. Stiles has the general superintendence, and gives the business his personal attention.

As has been so generally the case with successful American inventors, Mr. Stiles has carved out his own way in this his chosen line of business. He was born in Agawam, Massachusetts, in 1834, where his father was a farmer, but the latter lost his property when young Norman was but five years old. His mechanical turn of mind manifested itself at an early age, and when he was but ten years old he built an extension to his father's house, doing all the work himself—carpentering, joining, painting, etc. When he was about twelve years old he built a small fire engine and a miniature working steam engine. At sixteen he earned a journeyman's wages in making tin ware; and from the age of eighteen to twenty-one, he worked as an apprentice in the American Machine Works, at Springfield, Mass. In 1857 he established a small jobbing machine shop at Meriden, Conn., and then began to pay particular attention to the making of dies and presses. From that time to the present his mechanical skill and inventive turn of mind have been principally exercised in matters pertaining to these specialties, with practical results of which we have substantial evidence in almost every machine shop in the land.

A Coal Miner's Day's Work.

In a recent article on the use of compressed air in coal mining (SCIENTIFIC AMERICAN, February 7) it was stated that a day's work for two able-bodied miners is the bearing in of 2½ feet across 15 feet of coal. Mr. Charles Wyld, of Carbon, Indiana, writes that his usual day's work is to bear in from four to six feet in depth a distance of from twelve to fifteen feet; in other words, he does twice as much in a day as was allowed for two men in the article referred to. We make the announcement with pleasure, but regret that Mr. Wyld did not say whether his fellow miners do as well as he, or whether the average bearing in under all conditions is greater than the article stated.

AGRICULTURAL INVENTIONS.

Mr. Willis D. Green, of Mount Vernon, Ill., has patented an attachment for grain drills, by which, as it follows the delivery spout, the earth is pressed about the grain, packing it more closely at the sides than at the top, and pressing the soil down, forming channels, which will be gradually filled by the falling in of the sides, thus hilling the stalks of grain as they come up.

Mr. William A. James, of St. Louis, Mo., has patented an improved sulky plow provided with novel means for readily adjusting the various parts. The invention cannot be fully described without engravings.

Mr. David A. Swanson, of Rio Grande, O., has patented a combined hand corn planter and fertilizer distributer which is so constructed that the corn and fertilizer will be deposited at the same time and at the same depth or at different depths, as required.

Mr. Chapin C. Brooks, of Lancaster, N. H., has patented a reversible or side hill plow so constructed as to turn a furrow in either direction upon level or hilly lands.

Chasse's Multiplex Telegraph.

For some months a Frenchman, named Chasse, has been promulgating the most astonishing claims with regard to an alleged new process of telegraphing, by means of which an indefinite number of messages might be sent simultaneously in opposite directions over a single wire.

A few days ago practical telegraphers were invited to witness a demonstration of the process at the inventor's workshop in Hartford, Conn. There were eighteen telegraphic instruments at each end of the room, all connected with a single wire, supposed to represent a cross country line. Eighteen messages were sent each way, all at once, apparently through the single wire.

Among the witnesses was Mr. William Hadden, of the American Union Telegraph Company, who noticed that the insulated connecting wires were neatly fastened to the wall by double-pointed carpet tacks. On pulling one out he found that beneath each tack the covering of the wire had been neatly cut away, and an ingenious system of false circuits established by fine wires leading from the tack legs. The supposed cross-country wire was a sham and the too promising multiplex telegraph a clever cheat.

A Log Railroad.

A log tramway or railroad in use by the Richardson Brothers at their mill, south of Truckee, is a very ingenious piece of machinery. Logs, ten inches or a foot in diameter, are hewn round and smooth and their ends are coupled together by iron bands. These logs, laid side by side upon graded ground for a distance of perhaps three miles, form the track. Of course the road looks quite like an ordinary railroad track, except that logs are used instead of rails, and the ties are at much greater intervals. The wheels of the engine and cars are concave on their outer surface, and fit the curve of the logs. The power is applied to a wheel in the middle of the forward axle on the engine. The most remarkable loads of logs are hauled upon the cars, and the affair is a decided success. It is very cheap, its construction is simple, it is not easily damaged, and its operation is all that could be desired. By means of this log railroad the Richardson Brothers are enabled to get their logs to the mill from the forest, three miles distant, at a cost far less than it is ordinarily done.—*Truckee (Nev.) Republican.*

Decline in the British Flax and Linen Trades.

The recent report of the British Factory Department shows a remarkable decline in the linen trade of Great Britain during recent years. In 1871 there were in England, Scotland, and Ireland 500 factories; in 1878 there were only 400, the diminution showing chiefly in factories where spinning only is carried on. The number of spindles declined during the same period from 1,553,335 to 1,264,766. The number of operatives decreased from 124,772 to 108,806. The acreage planted with flax in 1871 was 17,366; in 1878 it had fallen to 7,481. There was at the same time a large falling off in foreign imports. In the same period the exports of linen yarn declined from 36,235,625 pounds to 19,216,C01 pounds; and the export of linen manufactured goods from 220,467,476 yards to 177,776,527 yards.

BENJAMIN FISH, of Trenton, N. J., has rounded up 94 years of a remarkable existence. He lent Commodore Vanderbilt $1,000 when that gentleman first started out in his career; brought down the first anthracite coal that descended the Delaware in 1823; managed the old stage line and steamboat company between New York and Philadelphia, fifty-five years ago; was one of the first directors of the Camden and Amboy Railroad, in 1830, and has been elected every year since. In 1833 he drove the first freight car that moved over the road between South Amboy and Bordentown. Horses were used that year. The first locomotive was imported from England; it is now standing in the shops at Bordentown, and is known as "Johnny Bull" and "Number One."—*Railway World.*

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IMPROVED CONTROLLING VALVE FOR ENGINES.

The annexed engraving shows two forms of controlling valve, invented by Mr. N. E. Nash, of Westerly, R. I., designed for application to engines doing variable work, such as hoisting, punching, and shearing metals, and many other varieties of work requiring an intermittent power.

The engraving shows one of the valves in longitudinal section, and the other having parts of the valve casing broken away to show the arrangement of internal parts.

The valve shown in Fig. 1 is similar to an ordinary globe valve on one side of the central partition, but a cylindrical ported extension, A, on the under side of the valve seat, is fitted with a plug or key, B, which is provided with ports corresponding with those of the part, A. The plug, B, has a stem, C, extending out through a stuffing box and provided with a hand lever by which the valve is opened or closed. The screw valve is adjusted to the maximum amount of steam, while the plug valve is used to reduce this quantity, more or less, down to just what would be required to keep the engine in motion.

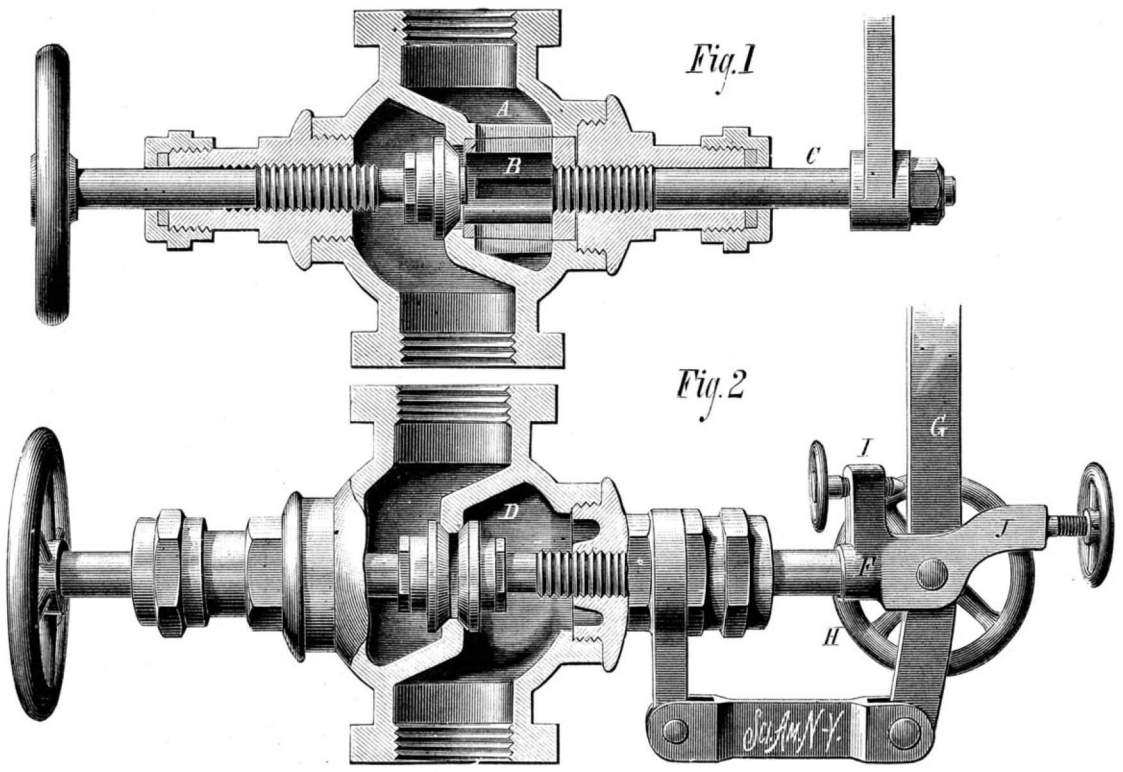
In this valve the stem, C, is screwed into the plug, B, and the first result of moving the valve lever is to loosen the valve in its slightly conical casing, so that when it is turned by the further movement of the lever it is not worn by contact with its bearings.

Fig. 2 shows a valve which answers the same purpose as that shown in Fig. 1, and like that valve, one half of it is similar to a common globe valve. The valve seat is provided with a supplemental valve adapted to be opened and closed independently of the main valve, but which is inoperative except when the main valve is open. By this arrangement the ordinary or main valve may be used to limit the area of the valve opening, while the supplemental valve is employed to open and close the limited aperture.

The stem of the supplemental valve, D, extends through an ordinary stuffing box, and is provided with a forked head in which is pivoted the hand lever, G. This lever is fulcrumed in a link jointed to an arm projecting from the stuffing box. The pivot of the lever, G, in the forked head, F, is in reality a clamping screw provided with a hand wheel, H, and capable of drawing the two arms of the head, F, together so as to bind the lever, G, in any desired position. The motion of the lever, G, is limited in both directions by two screws passing through the arms, I J. By properly adjusting the screw in the arm, I, the minimum of steam supply is regulated and the maximum is regulated by turning the screw in the arm, J.

The advantages of these valves will be at once recognized by engineers and machine owners running engines at variable speeds or where a variable power is required. The main valve may be set and locked by some person in authority to give the desired maximum velocity to the engine, when the supplemental valve may be operated by an unskilled attendant without danger of injury to the engine or machinery connected with it.

Further information may be obtained by addressing Mr. J. M. Pendleton, Westerly, R. I.

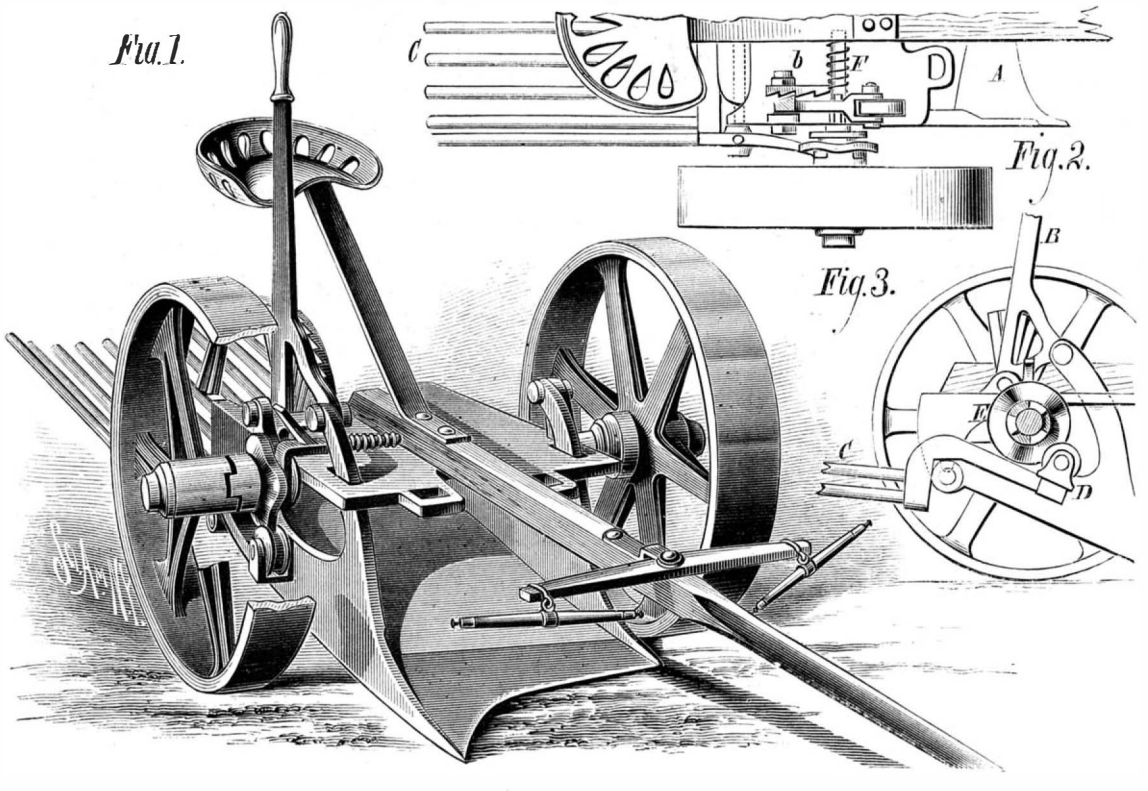


NASH'S CONTROLLING VALVE FOR STEAM ENGINES.

NEW POTATO DIGGER.

The improved potato digger shown in the accompanying engraving is the invention of Mr. James B. Taylor, of West Hurley, N. Y. It is not only adapted to digging potatoes, and freeing them from earth, but it may also be used to advantage for loosening the soil and destroying grass and weeds between the rows.

The plow, A, is suspended from a long bolt that extends across the rear of the machine frame, and is provided with a curved arm which is jointed to a lever, B, pivoted to the main frame and capable of engaging with a ratchet, *b*, so as to hold the plow at any desired elevation. A screen, C, consisting of a series of fingers projecting from a cross bar, is pivoted at one side of the machine, on the same bolt that sustains the plow, and is provided with an arm, D. At the opposite side of the machine the screen is supported by a small roller also on the bolt that supports the plow. The end of the arm, D, carries a roller that is engaged by a zig-zag cam on the axle. This cam is movable on the axle, and is provided with lugs that may be thrown into or out of engagement with clutch teeth on the hub of the driving wheel by a shifting bar, F, which is always pressed forward by a spring tending to throw the cam into engagement with the drive wheel. The shifting bar is provided with an inclined arm which is engaged by the lever, B, whenever it is thrown back to raise the plow, thus throwing the cam out of gear. It will thus be seen that by moving the lever, B, so as to throw the plow into position to operate, the shifting bar, F, is released, and the spring throws the cam forward into engagement with the drive wheel. As the machine is drawn forward the plow, A, passes under the hills of potatoes, and both potatoes and earth are forced backward over the screen, C, which being vibrated by cam, E, separates the earth from the potatoes and delivers the latter in rows on the top of the ground. In the engraving, Fig. 1 shows the implement in perspective, Fig. 2 is a partial side elevation, and Fig. 3 is a partial plan view.



TAYLOR'S POTATO DIGGER.

A Singular Accident.

A machinist, employed in the Erie railway machine shops, Jersey City, incautiously went to sleep during the dinner hour on a bench through which a large auger works. The whistle for starting did not rouse him, and when the machinery was set in motion the auger began to bore obliquely through his leg. His cries attracted the attention of his fellow-workmen, but before the machinery could be stopped his leg was bored through just below the knee.

Mr. Vance on the Value of our Patent System.

In a discussion on the revision of the House Rules, Feb. 12, Mr. Vance moved that clause 24 of rule xi. should provide that the Committee on Patents receive the estimates and report the appropriation bills for the support of the U. S. Patent Office. After showing that the Patent Office was more than supported by the inventors of the country, Mr. Vance said:

"I think it is a reasonable proposition, as the Patent Office is supported by the money paid into it by the inventors of the whole country, that the Committee on Patents should have exclusive jurisdiction and control of the legislation affecting this great interest. While it is admitted that the interests of agriculture are of great importance to the country, it cannot be denied that the development of the country, and the development to a large extent of agriculture itself, are greatly indebted to the success of our system of patents. The interests of agriculture in this country have been greatly enhanced by the development of the patent system. There is no one department of this government which has done more for the material welfare and prosperity of the people than that. The million of bushels of grain, of corn, wheat, and every other kind of grain known to our agricultural interests have been added to and increased by the invention and successful operation of labor-saving machinery, fostered, as such inventions have been, by the patent laws of this country. I think it is true that the appropriations for the Patent Office for many years were reported by the Committee on Patents, and I see no reason why they should not continue to be reported by that committee.

"At the present time it is very important that the Committee on Patents should have control of the appropriations, from the fact that I hold in my hand the report of the Commissioner of Patents, which states that he has not under his control a sufficient force to do the work of the office, and it is alleged to be a fact, and I believe it to be true, that at this time the inventors of the country are compelled to wait a month before they can receive their patents after the application has been filed."

The amendment was rejected.

A Runaway Railroad.

An attempt was made at Oil City, Pa., Feb. 10, to take up, in a novel way, the rails of a disused inclined railroad a quarter of a mile long. The hill being steep and icy, it was impossible for workmen to take up the rails by working along the road, but as the rails had been joined together at the ends when they were laid, and made continuous strings of iron from top to bottom of the hill, the plan of starting each string entire by taking out the spikes and pulling it down at the bottom was hit upon. A number of the bottom rails of one line were removed, and then a rope was attached to the rest and a team of horses set to work to start the whole. The line of rails, nearly a quarter of a mile long, started from its place, but the ties being covered with ice, a result unlooked for by the engineer in charge followed. The long string of iron started down the hill by its own gravity, and was in a few seconds rushing along at great velocity. When the lower end struck the street at the bottom of the hill the string of rails was disconnected in several places, and instantly rails were flying through the air in all directions, some of them being carried 300 feet. A long section of the line remained intact, and continued on its way. It dashed across the street, passed clear through a barn, grazed the corner of Mrs. Case's dwelling, demolished an outhouse, and continued on with apparently undiminished speed. Leaving Mrs. Case's garden, the line of iron dashed

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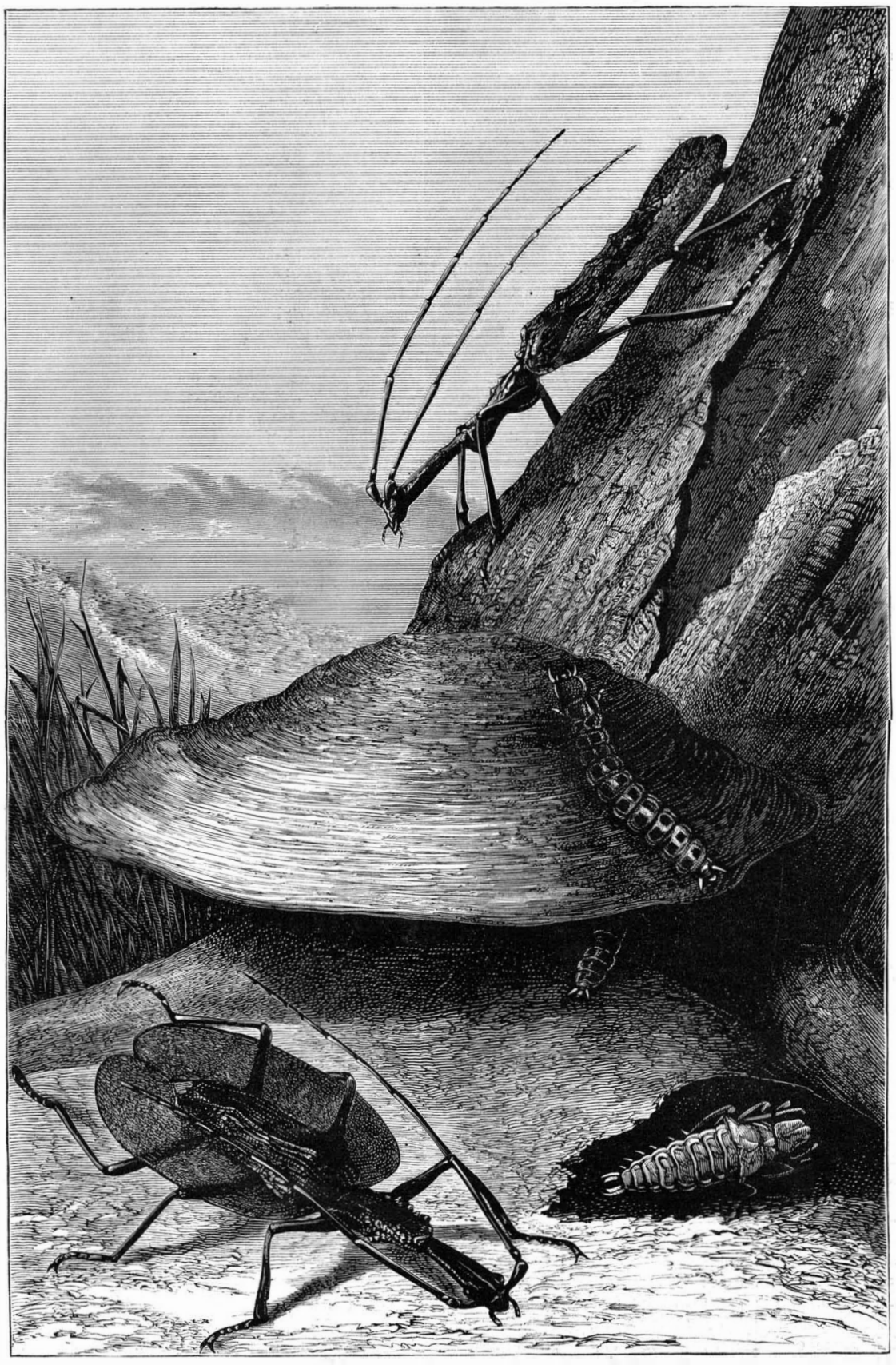
into the back yard of the James House, and pointed directly for the kitchen of the hotel, where several girls were at work. Fortunately, something turned the flying iron a few inches from its course, and it came in contact with a stone wall. This separated the rails into two parts. One was hurled a hundred feet into an adjoining garden, where it plowed up the ground for a long distance and was brought to a stop. The other portion leaped into the air and struck a chimney on the kitchen of the hotel. From there it was thrown to the roof of a three-story house some distance away, where it tore off the shingles for twenty feet and struck a high chimney, which it partially wrecked. Its force was then spent, and the iron, a section fifty feet long, rested in the midst of the ruin it had wrought. The rest of the railroad on the hill will be taken up in the old-fashioned way.

THE LEAF MORMOLYCE.

This insect, which is found on the Island of Java, has all its members well developed. The outer wings are especially developed in the horizontal plane, and give the insect a most singular appearance. The head is connected with a disk-shaped prothorax having serrated edges. The eyes are large and prominent, and the antennæ almost as long as the insect. The outer wings are covered with longitudinal flutings crossed by a number of transverse ridges. The inhabitants call the insect the "violin," on account of its resemblance to form of that instrument. The insect is not very well known in Europe, the first being brought thither in 1820 by Messrs. Kuhl and Hasselt. The annexed engraving, which we take from *La Nature*, represents the larvæ and the insect in full size.



THE METAMORPHOSES OF THE LEAF MORMOLYCE OF JAVA.—(*Natural size.*)

Coal.

Professor T. Rupert Jones, F.R.S., lately delivered a course of three lectures at the Royal Institution, London, giving a detailed account of the organic remains, or fossil plants and animals, found in coal and coal measures, compared with those associated with other fossil fuels. He then took a comprehensive survey of the whole ground trodden throughout the course. Under one division of the subject he had pointed out that the different kinds of fossil fuel, from peat to anthracite, graduate in their composition from that of wood to that of nearly pure carbon. He had intimated that wherever and whenever large quantities of vegetable matter had been accumulated and covered up more rapidly than they had decayed, there seams of coal or of some other mineral fuel had been produced. The chemical changes which the trees and other plants had undergone after their accumulation—as fallen trunks, branches, leaves, and spores, with creeping stems, roots, and rootlets—in wet jungles and peaty swamps, had variously rearranged their constituent carbon, hydrogen, and oxygen. The results were: (1) thin laminæ of hydrocarbonaceous coal, shining or dull, which alternate with thinner films of mineral charcoal (the product of subaerial rotting), where damp forest growths prevailed; (2) layers of spores (white coal of Tasmania), or of leaves (fir needle coal of the Hanover wealden); (3) hydrocarbonaceous coals, more or less homogeneous in structure, where swamp lakes and peat bogs occupied the area of growth. Some coals might always have contained a relatively large proportion of touchwood and charcoal, and have been subjected to pressure, driving off the hydrogen with some of the carbon. In either case, anthracite coals had resulted, and natural distillation had produced various secondary hydrocarbons, such as albertite, bitumen, petroleum, and naphtha. The history of the geological strata, from mountain limestone, through millstone grit, to the coal measures, their disturbances and present position, was thus brought within the reach of man's skill and labor. The lecturer concluded by pointing out that the study of the coal measures was of great importance as a branch of natural history not to be ignored in the general scheme of a good education.

Packing Apples for Shipment.

At the recent horticultural meeting at Rochester, N. Y., Mr. Barry opened the question: "Have there been any recent improvements in the methods of packing and shipping fruit?" by asking "What is the best method of packing fruit for foreign shipment?" He used paper for wrapping the fruit in, but knew of others using chaff in addition. Mr. Vick had tried several ways, but preferred using strong manila paper in which to wrap the fruit. In packing in the barrel he placed a layer of buckwheat chaff between each layer of apples, and in the ends put a deeper layer of chaff. He had shipped several kinds with success in this manner. Mr. Hooker objected to the use of the chaff, as it would be liable to impart a flavor to the fruit. He thought that good fruit, packed solidly, would stand shipment to a foreign market. He would advise picking the fruit as soon as matured. Mr. Moody thought well of the plan of having fruit houses, where the fruit would pass through the sweating process before being barreled. Mr. Hoag had a ventilated fruit house in which he allowed his fruit to cool, and where he kept it till November. Mr. Moody thought the thorough assorting of apples a necessity; they should be handled quickly and very carefully, and be left in the sun no longer than necessary. Mr. W. C. Barry left his apples in the orchard till they had passed the sweating process. He thought they should not be placed in barrels till after that—nor should they be shipped abroad till cool weather commenced. Mr. Woodward said apples should be picked early and handled but little. When they snapped easily from the stem it was time to pick them. They should not be barreled till ready for sale. Mr. Clark picked some apples the last week in October, and had but just opened them. He found them to be in good condition.

NATURAL HISTORY NOTES.

Vertical and Horizontal Leaves.—Griesbach, in his account of the vegetation of Australia (says Mr. Moseley in his "Notes of a Naturalist"), dwells on the close relation of interdependence which exists between the tree vegetation and the coating of grass which covers the ground beneath it, and remarks that the amount of light allowed by the trees to reach the ground beneath them is rendered more than usually great by the vertical position in which their leaves grow. Hence the growth of the grass beneath is aided. It may be that this permitting of the growth of other plants beneath them, and consequent protection of the soil from losing its moisture, besides other advantages to be derived, is the principal reason why, as is familiarly known, two widely different groups of Australian trees, the eucalypti and acacias, have arrived at a vertical instead of a horizontal disposition of their leaves by two different methods. The acacias have accomplished this by suppressing the true horizontal leaves, and flattening the leaf stalks into vertical pseudo-leaves, or "phyllodes." The gum trees, on the other hand, have simply twisted their leaf stalks, and have thus rendered their true leaves vertical in position. There must exist some material advantages which these different trees derive in common from their peculiar arrangement, and the benefit derived from relation to other plants by this means may be greater and more important than that arising from the fact that the vertical leaves have a like relation to the light on both sides, and are provided with stomata on both faces. In support of this conclusion I was told when at Melbourne that when the native vegetation was cleared away from under gum trees they ceased to thrive and in time perished. I was shown a number of gum trees not far from the city, scattered over some public land, covered with only short turf, which seemed to be mostly in a dying condition.

The Power of Movement in Leaves of Conifers.—Dr. Maxwell Masters, at a meeting of the Linnæan Society, Dec. 4, called attention to the contrasts to be drawn between the leaves of the spruce firs (*Picea*) and those of the silver firs (*Abies*), as regards their arrangement, relative position, form, relative size, and internal structure, as described by Bertrand and others. The leaves of the silver firs are endowed with a power of motion in virtue of which they are raised or depressed. On the other hand, the leaves of the spruces are comparatively motionless. In those cases where the leaves have the power of movement there is usually a well-marked layer of "palisade cells" which are absent in motionless leaves. This circumstance has led Dr. Masters to correlate the differences before alluded to with varying degrees of functional activity, and with the adaptations manifested to secure as far as possible to each leaf an equally favorable amount of exposure to light, etc. The very remarkable movements of revolving mutations observable in the "leader shoots" of many conifers during their season of active growth were mentioned as having been investigated by him and the rotation duly registered on a disk.

Migration of Plants from Europe to America.—Professor Claypole, in a lengthy paper on this subject, read before the Montreal Horticultural Society, calls attention to and enumerates the vast number of weeds which have migrated from Europe to America and become so thoroughly naturalized

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here that they prevail over some of the plants native to the soil; while only three or four American weeds have crossed the Atlantic and become naturalized in Europe. Having shown that the difference in climate and the conditions of mutual commerce do not fully account for this marked difference in the migrative power of the two floras, he next points out the fact that in the Miocene era the European and American floras were very much alike, but that since that time the European flora has been vastly altered, while the American flora still retains a Miocene aspect, and is, therefore, the older of the two. Professor Claypole is led to conclude that this long persistence of type in the American flora may have induced, by habit, a rigidity or indisposition to change, while the changes in the European flora since the Miocene era betray a plasticity of nature, or power of adapting itself to circumstances, of which the American flora gives no sign. From this view, the European flora is better able to adapt itself to the strange climate and conditions—that is, to emigrate—than the American flora, and being thus made plastic or adaptable, it succeeds in the New World, while the less adaptable American flora fails in the Old World.

The Rose of Jericho.—This curious plant, which in a dried state is often sold as a curiosity, has recently been correctly and well described by the veteran botanist, Mr. J. Smith, ex-curator of Kew Gardens, in a little work entitled "A History of Bible Plants." After detailing certain passages of the Scriptures which are supposed to refer to the "Rose of Jericho," he proceeds to say: "It is an annual, having a tap root from which numerous branches are produced, forming a circular disk about a foot in diameter, at first lying nearly flat on the ground. It has small leaves, and small white flowers at their axis. When the seeds are perfected, the stems become dry, hardened, and incurved, their points meeting and forming a skeleton hollow ball, which in time (by the power of the wind) loses hold of the ground, and, being blown about, rolls and turns like a wheel." This plant belongs to the natural order Cruciferæ, and has been rendered famous by the peculiar hygrometric properties of its stem and branches. It affords a very interesting example of the means by which nature effects the dispersion of seeds. The fruit is a small roundish silicle with two woody valves each, each of which terminates at its apex in an acute point. During the dry season these plant balls are scattered far and wide by the winds over the sandy tracts of land extending from Syria to Algeria, and on the return of the rains the branches spread out, the diminutive silicles burst and release the seeds, which speedily germinate in the damp warm soil. This alternate closing and expanding of the branches continues for many years. Concerning the strange manner in which these singular plants are scattered, the traveler, Dr. Thompson, has written as follows: "When ripe and dry in autumn, the branches become rigid and light as a feather, the parent stem breaks off at the ground, and the wind carries these vegetable globes whithersoever it pleaseth. At the proper season thousands of them come scudding over the plain, rolling, leaping, and bounding to the dismay of both horse and his rider. Once, in a plain north of Hamath, my horse became quite unmanageable among them."

A Fly-catching Plant.—We have one plant in our gardens, says Knapp in his "Journal of a Naturalist," a native of North America, than which none can be more cruelly destructive of insect life, the dog's-bane (*Apocynum androsæmifolium*) which is generally conducive to the death of every fly that settles upon it. Allured by the honey on the nectary of the expanded blossom, the instant the trunk is protruded to feed on it, the filaments close, and, catching the fly by the extremity of its proboscis, detain the poor prisoner, writhing in protracted struggles till released by death—a death apparently occasioned by exhaustion alone; the filaments then relax, and the body falls to the ground. The plant will at times be dusky from the numbers of imprisoned wretches.

Consciousness in the Acquirement of Instincts.—Most naturalists, says Mr. Darwin (*Nature*, January 8), appear to believe that every instinct was at first consciously performed; but this seems to me an erroneous conclusion in many cases, though true in others. Birds, when variously excited, assume strange attitudes and ruffle their feathers; and if the erection of the feathers in some particular manner were advantageous to a male whilst courting the female, there does not seem to be any improbability in the offspring which inherited this action being favored; and we know that odd tricks and new gestures performed unconsciously are often inherited by man. We may take a different case (which I believe has been already advanced by some one), that of young ground birds, which squat and hide themselves when in danger immediately after emerging from the egg; and here it seems hardly possible that the habit could have been consciously acquired just after birth without any experience. But if those young birds which remained motionless when frightened were oftener preserved from beasts of prey than those which tried to escape, the habit of squatting might have been acquired without any consciousness on the part of the young birds. This reasoning applies with special force to some young wading and water birds, the old of which do not conceal themselves when in danger. Again, a hen partridge when there is danger flies a short distance from her young ones and leaves them closely squatted; she then flutters along the ground as if crippled, in the wonderful manner which is familiar to almost every one; but, differently from a really wounded bird, she makes herself conspicuous. Now it is more than doubtful whether any bird ever existed with sufficient intellect to think that if she imitated the action of an injured bird she would draw away a dog or other enemy from her young ones; for this presupposes that she had observed such actions in an injured comrade and knew that they would tempt an enemy to pursuit. Many naturalists now admit that, for instance, the hinge of a shell has been formed by the preservation and inheritance of successive useful variations, the individuals with a somewhat better constructed shell being preserved in greater numbers than those with a less well constructed one; and why should not beneficial variations in the inherited actions of a partridge be preserved in like manner, without any thought or conscious intention on her part any more than on the part of the mollusk, the hinge of whose shell has been modified and improved independently of consciousness?

The Kalmia and its Insect Visitors.—While it is generally admitted that the gay coloration of flowers is mainly subservient to the purpose of attracting bees and other winged insects whose visits play so important a part in the process of fertilization, one important fact has not received sufficient attention. It has already been pointed out by Mr. J. W. Slater, before the Entomological Society of London, that certain conspicuous flowers are avoided by bees, or if visited by them produce an injurious or even fatal effect upon the insects. Among such flowers are the dahlia, the passion-flower, the crown-imperial, and especially the oleander. The honey of the latter is said to be fatal to flies also. The cultivation of the dahlia has been pronounced incompatible with the success of the bee-keeper. A writer in the December number of *Science Gossip* records a few observations made on our American plant, the *Kalmia latifolia*, from which it would appear that this plant may also be included among those whose attractive flowers prove deadly to the bee which visits them for their nectar. It is a well known fact the genera azalea, rhododendron, and kalmia are narcotic, and that the honey extracted from their flowers possesses poisonous properties. Thus, *Rhododendron punctatum* yields, according to Michaux, a honey which is deleterious; and the honey of Trebizond, which is supposed to be derived from the *Azalea pontica*, has poisonous qualities which cause headache and vomiting. The flowers of *Rhododendron arboreum* of India, however, are eaten by the natives, and are likewise made into a confection by them. Notwithstanding the poisonous nature to man of the honey gathered from the flowers of these genera, no mention seems to have been made before of the fact that it is equally so to bees. The visits of bees to the flowers of the *Kalmia* have been supposed to be advantageous to the plant in setting free the anthers, which are lodged in depressions in the corolla, and which when loosened spring forward and discharge their pollen on the stigma.

Narcotism from Nutmegs.

The fact that nutmegs have strong narcotic properties has long been known, but they are in such common use as a favorite condiment used in small quantities that their dangerous nature when taken in large quantity is apt to be overlooked and forgotten, even by those who are aware of their tendency. A physician reports, in one of our medical exchanges, a case where a lady patient during his absence was induced by her old woman nurse to take nutmeg tea. One and a half nutmegs were used in making the tea, and the patient drank the whole of the decoction during the day. About 10 o'clock at night she began to get drowsy, and by 4 o'clock the next morning she was in a profound stupor. At 10 o'clock the next morning the narcotic effects of the nutmeg began to wear off, and by 4 P.M. she had pretty well recovered. The symptoms were about the same as those produced by opium, and the remedies given for them were the same.

Nutmeg in the quantity of two or three drachms has been known to produce both stupor and delirium; and dangerous and fatal consequences are said to have followed its free use in India. Mace, which is the outside covering of the nutmeg, possesses essentially the same properties.

Protection of Young Trees.

Where it is desirable to pasture sheep or hogs in orchards, or where rabbits make depredations, the bark of young trees may be successfully protected by washing the trees in spring, and again in midsummer, for sheep, and in late autumn for rabbits, with soap suds and carbolic acid, or a solution of coal tar and whitewash. Both are sure in accomplishing the end in view, and are valuable in keeping off the borer and in giving a healthy surface activity to the sap, which will make the bark look fresh and healthy. An ounce of carbolic acid to a pail of soap suds is sufficient.

Preparation of Rhea Fiber.

The Government of India, in 1870, and again in 1877, offered rewards for the discovery of a cheap and rapid mechanical or chemical process for the preparation of rhea fiber, which is at present worth from £40 to £50 per ton in England. Fifty thousand rupees for the best invention, and ten thousand rupees for the next best. A keen competition promises to take place shortly at Saharanpur, between twenty-three gentlemen from England, America, France, Denmark, New Zealand, Batavia, Hungary, and from parts of India. The judges of the trial will, says the *Homeward Mail*, have to describe the processes and determine whether the conditions of the government notification have been complied with or not, while the quality of the fiber produced will be left to experts at home.

Effects of Kidney Diseases Upon the Eyes.

The frequency with which retinal changes are found in kidney disease has been variously stated by different authorities. Earlier statistics were based on affection of vision, and the frequency assigned was altogether too low, while some ophthalmic surgeons, seeing cases only in which sight was impaired, have thought that retinal changes were almost invariable. Wagner found albuminuric retinitis in 9 per cent of the cases, Galezowsky in 33 per cent, and Laudouzy in almost every case. It is, however, well known that the frequency with which the retinal changes occur varies much in different forms of kidney disease, and it is, therefore, desirable that in observations which are made, the forms of kidney disease should be distinguished. This has been done by Mr. Eales, of Birmingham, who, in an interesting communication to the current number of the Birmingham *Medical Review*, has described an investigation of the state of the retina in 100 cases of granular kidney, the primary object being to determine the percentage of cases in which retinal changes are present. For the diagnosis of the renal disease in every case Dr. Saundby was responsible. The results contained confirm nearly the statement of Galezowsky, alterations being found in one-third of the cases. They confirm also the fallacy of taking sight as the test of retinal integrity. In 46 cases inquiries were made as to the state of vision before atropine was instilled; in 28 of these complaint of bad sight was made, but in only 6 (that is, a little more than 1 in 5) could any obvious abnormal condition be discovered in the retina; while in 18 persons, who stated that their sight was good, retinal changes, such as specks, were found in 5. The frequency with which considerable retinal changes do not materially impair sight is shown by 6 cases in which vision was carefully obtained by test types and lenses, and found, even with dilated pupils, to be nearly normal, and yet in all considerable changes were found in the retina.

The number of cases in which some abnormal change was found in the retina was 28, in 12 of which the changes existed in both eyes, while in 16 they existed in one eye only. Observers have usually described the changes as bilateral, and Mr. Eales thinks that his observations can only be reconciled with those of others by supposing that the affection often attacks one eye before the other, and that it gets well in one eye before the other. In the 12 cases in which changes were found in both eyes, 4 had diffuse retinitis, with "fibrinous" patches and œdema, and also whitish glistening patches; 1 had diffuse retinitis in one eye with only one hemorrhage in the other eye; 5 had many whitish round patches "of the atrophic kind," and 2 had only similar small patches. Of the 16 cases in which changes were found only in one eye, in 6 several white round patches were found, in 5 one or two spots only; in 1 there was a single hemorrhage near the disk; in 2 a few black specks were found, associated in one case with white specks, the black being in the center of the white speck. In addition to these 28 cases of retinal change 3 others presented slight changes in the papilla, commencing or subsiding neuritis. In 14 cases opacity of the lens existed, double and incipient in 11 cases, single in 3 cases. The presence of these alterations bore some relation to the amount of albumen in the urine, and 1 in every 2 patients with constipated bowels presented retinal changes, while such changes were found only in 1 in every 6 with open bowels.—*Lancet.*

The Transmission of Scarlet Fever by Milk.

A report has been issued by the Local Government Board on a sudden outbreak of scarlet fever at Fallowfield, near Manchester, England. The outbreak included 35 persons, belonging to 18 families, and of the individuals who suffered not less than 24 were attacked within 36 hours, between Sunday morning and Monday evening. Dr. Airy was directed by the Local Government Board to investigate this outbreak, and the results of his investigation are, says the *Lancet*, given in the report now before us. The outbreak was quite local, and the different details elicited tended to the general result that the infection had been distributed to the families through the agency of a particular milk supply. The facts bearing on this point do not well admit of any other interpretation. The question of the mode in which the milk could have become infected was not so fully cleared up, but it is shown that one of the milkers on the dairy farm lodged in a farm-house where scarlet fever was present at the time when the milk presumably became infected, and it is suggested that the infection was communicated to the milk, in some way undetermined but not inconceivable, through his agency. The report throughout is of very considerable interest, and forms an important contribution to our knowledge of the *mechanism*, if we may so write, of certain of the observed phenomena marking the progress of infectious diseases.

American Rum Drinkers.

Referring to the drinking habits of the Americans, Mr. Read gave it as his opinion that sobriety was not so real as it appeared, for a great deal of drinking goes on privately. He said: "The American drinks so differently from the Englishman. They take grog as Englishmen take physic. They never meet together for sociability, hilarity, and noisy revelry; but rather go up to the bar, and taking a small glass of whisky, toss it off, and immediately follow this up by taking a glass of iced water—just as children in England take castor oil." As regards Sunday closing, Mr. Read's experience in America has convinced him that he ought not to vote for our Sunday closing bill when it comes before Parliament next session. He found that while the front door

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of grog shops was closed by law, the back doors were open by the common consent of the people; and he justly remarks that "to pass laws which are never meant to be enforced is worse than passing no laws at all." Altogether, Mr. Read's visit to America has convinced him that the prohibitory policy in connection with the liquor traffic in that country has been a failure, and it would therefore be a great mistake for us to follow their example.—*Brewers' Guardian.*

THE CONDITION OF FRENCH WORKMEN.

The British Society of Arts, just before the last French Exhibition, appointed a number of experts, in different lines of business, to prepare special reports covering the state of many of the principal industries, as represented there. One of the topics to which especial attention was directed was the condition of French workmen, which is considered with reference to: 1. Hours of work and wages; 2. Rent and cost of living; 3. Organization among workmen; 4. Technical schools and art teaching; 5. Home life.

These so-styled "Artisan Reports" have been published very tardily, ample time having been taken in their preparation; but the one above noticed, which has just been brought out, can hardly be said to add materially to the information which has many times heretofore been laid before American readers by the publication of our consular reports. Particular stress is laid on the long hours of which the French workman's day usually consists, the time of commencement varying more than in England or here, but the day usually lasting ten or twelve hours. Nothing, however, is mentioned in regard to the generally easy and comfortable way in which they work, as though the idea of accomplishing a certain amount in a given time was never an element in their calculation. The average rate of wages is generally lower than in England, though there are many trades in which they are about equal, or the difference is but slight. Mechanical engineers are reported as receiving 5½ francs per day of eleven hours, while smiths earn 8½ francs for twelve hours, fitters 6 to 7 francs, and pattern makers 7 to 9 francs for a day of ten hours, the wages of the smaller factories being slightly higher than those paid in the larger establishments; a first-class mason gets from 8 to 10 francs a day, and a second-class or rough mason from 6½ to 7 francs, an ordinary bricklayer also receiving about the latter figure. It would not be matter of surprise, if what would be considered in America a good day's work were obtainable in France at these low rates, that the French Government is laying out such vast schemes of internal improvement, in the way of railroads, canals, grand highways, and harbor improvements, but it is questionable whether, considering the amount of labor performed, the rates are really very much cheaper than here. There is one great difference, however, and that is that nearly every one in France is employed; there are few idlers among what are known as the productive classes, and not only the men but the women and children also are active participants in the labor of bread winning.

In the matter of rent and cost of living, as compared with the rates in England, these "expert" reporters vary widely in their conclusions. Probably it would be found, that under equal circumstances, there would be little variation between France and England, but it is not easy to make a comparison that is of any value, for the French laboring classes are not only extremely economical, but a large proportion of them limit themselves even as to the amount of their consumption of the extremely coarse fare on which they principally subsist. They are frugal even to parsimony, and will generally save something, no matter how small their income, stinting themselves in their daily fare, and wearing only the coarsest clothes in order to accomplish this, in all of which they follow exactly the opposite course from the English mechanic, who will have his roast beef as often as possible, and will in anything be stinted rather than in the satisfaction of his stomach, whether he saves or runs in debt, if the latter be possible.

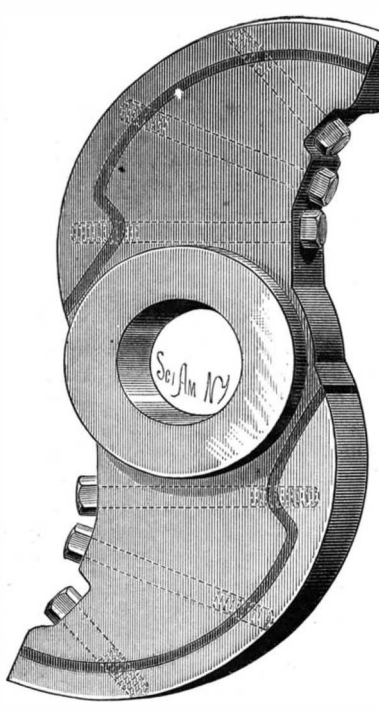
The almost entire absence of trades unions in France is noted here, as it is in almost every other treatise on French industry. The laws would not allow such associations of this kind as we have here, and the political societies or clubs, which are so numerous, though they discuss labor questions to some extent, are generally formed of members of different trades, and so have little or no influence on the rates of wages in any one industry. One great obstacle, however, to trades union organizations, and which operates most effectually in the prevention of strikes, not only in France but in Germany and other parts of Europe, is the great number of special organizations for the benefit of workmen and their families. This matter is treated as of no account in these reports, and it is stated that workmen out of employment or in distress have generally to depend on the government or private benevolence. They have not, it is true, the funds of any trades union society to fall back upon, but in a large proportion of the considerable manufacturing establishments in France a small sum is regularly set aside weekly or monthly by the employer, which is invested so as to form a fund for the relief of such cases.

Rewards are also given for exceptional merit, and for length of time in continued service, so that each year of employment in the house adds to the amount which a man or his family can obtain when old age or sickness prevents his earning his livelihood. In not a few cases, also, schooling for the children and medical attendance for the family are provided, the advantages of which are more or less freely accorded as the workman has proved himself steady and faithful. One large Paris manufacturer, employing over two thousand hands, has also founded a fund, to which he was a liberal contributor at first, and which is invested in government securities, which provides a pension on which worn-out employes, who have been in the establishment a sufficient number of years, can live comfortably on retiring, and those who remain for only five years can have, on leaving, if they leave for no misconduct or dereliction, either a small annual allowance with the privilege of again returning to work, or a lump sum if they prefer the latter. It is because there are so many benefits of this kind, accruing from continued employment and good character, in a large proportion of the French manufacturing establishments that we have so little of strikes there. There is a hearty good will and accord between employer and employed, which is not generally found here, and which goes farther to prevent labor troubles than all the laws which governments can exact or the payment of even the highest rates of which the most ardent trades unionist could ask.

IMPROVED CAM FOR STAMP MILLS.

The annexed engraving represents an improvement in the construction of cams, such as are commonly used in lifting the stamps of crushing mills. The invention consists in a removable shoe attached to the body of the cam by means of bolts, and backed by an elastic cushion or packing. This construction admits of the ready replacement of the shoe when worn, and it gives to the cam a yielding quality, which not only saves it from undue wear, but also modifies the action of the cam to such an extent as to prevent all violent and sudden blows, which are commonly so destructive to stamp mills.

Although the joint surface between the shoe and the body of the cam may be plain or corrugated, the inventor prefers the form shown in the engraving. The bolts which hold the shoes pass rather loosely through the cam body to admit of the yielding of the shoe, but they are screwed firmly into the shoe and move with it. In the cam represented by the



MOORE & DYKES'S CAM FOR STAMP MILLS.

engraving three bolts are employed to held each shoe, but we are informed by the inventors that two bolts are sufficient.

In case the shoe becomes beveled after considerable wear it can be changed from one arm of the cam to another, or to any other cams in the battery.

This useful improvement has been recently patented by Messrs. L. A. Moore and J. Dykes, San Francisco, Cal.

Zincography for Amateurs.

In a recent paper read before the London Society of Arts, Mr. Thomas Bolas, F.C.S., described zincography as a simple and easy mode of printing in the following fashion: Zincography, he said, is similar to lithography, except that a zinc plate is employed in the place of the lithographic stone. The so-called transfer paper is merely a moderately fine paper which has been brushed over, on one side, with a mucilaginous mixture, prepared by boiling together the following: Water, 1,000 parts; starch, 100 parts; gamboge, 6 parts; glue, 1 part. This paper is written upon with the ordinary commercial lithographic writing ink, which has been rubbed up with water like an artist's water-color. The writing being dry, it is necessary to moisten somewhat the back of the transfer by means of a damp sponge; after which it is laid face downward on a sheet of ordinary roofing zinc, which has been previously cleaned by means of emery cloth. Both being now passed together under the roller of a small press, the transfer adheres to the metal plate; but on damping the back of the paper it becomes easily removable, leaving the writing on the zinc. The face of the zinc plate is now gently rubbed over with mucilage of gum arabic, which is all the better for being slightly sour, and the excess of gum having been sponged off, an India rubber inking roller, charged with ordinary printer's ink, is passed over the still damp zinc plate a few times. The ink takes only on the lines of the transferred writing, and it is now merely necessary to lay a sheet of white paper on the plate and to pass both through the press to obtain an impression—an exact reproduction of the original writing.

Any number of copies can be printed by repeating the operations of damping and inking. The zincographic process, thus simplified, is rapid, economical, and within the reach of every one.

Why Teeth Decay.

Upon a careful review of the opinion and experiments of our best investigators, says Doctor S. M. Prothro in a paper read before the Tennessee Dental Association, it is conclusive that there are but two active agents in the process of dental caries, namely the action of acids and the development of a vegetable parasite, the *Leptothrix buccatis.* By actual experiments it is demonstrated that it does not require strong acids to separate the phosphoric and carbonic acids from the lime contained in the tooth substances. Even water that contains carbonic acid will dissolve the calcareous salts. And it seems from a circumstance that transpired under the eye of Mr. Spence Bate, that water alone can dissolve the teeth. A lady having two sets of artificial human teeth, placed one set in water to preserve it till she had worn out the other. At the expiration of seven years, the set that she had kept in water was as much corroded as the one she had worn in the mouth. This case corroborates a statement made by Wedl and Heider, that at the end of ten days fungi had attacked the enamel and dentine of the teeth that had been kept in pure water, and that in a few weeks the tissues were pierced with holes like a sieve.

All mineral, as well as vegetable acids, act promptly on the teeth. "In forty-eight hours acetic, citric, and malic acids will corrode the enamel so that you may scrape a great portion of it away with the finger nail." Acid tartrate of lime, having a greater affinity for the lime of the tooth than for its own base, will rapidly destroy the enamel.

Grapes, in forty-eight hours, will render the enamel of a chalky consistence. Vegetable substances are inert till fermentation takes place and acetic acid is formed. Sugar has no deleterious effect, only in the state of acetous fermentation. Animal substances exert no injurious effect until putrefaction is far advanced.

Novel Mode of Preserving a Man's Reason.

A curious story is going the rounds of the English newspapers of an exhibition in the show windows of one of the leading jewelers of Vienna. The object of attraction is a brooch magnificently studded with gems, in the middle of whose chasing is inclosed the most singular of centers—four common, old, bent, and corroded pins. This brooch is the property of the Countess Lavetskofy. The pins have a history, of course. Seven years ago Count Robert Lavetskofy, as the story runs, was arrested at Warsaw for an alleged insult to the Russian Government. The real author of the insult, which consisted of some careless words spoken at a social gathering, was his wife. He accepted the accusation, however, and was sent to prison.

In one of the lightless dungeons in which the Czar is said to be fond of confining his Polish subjects, the unfortunate martyr for his wife's loose tongue spent six years. He had only one amusement. After he had been searched and thrown into a cell, he had found in his coat four pins. These he pulled out and threw on the floor; then in the darkness he hunted for them. Having found them, perhaps after hours and even days, he scattered them again. And so the game went on for six weary years. "But for them," he writes in his memoirs, "I would have gone mad. They provided me with a purpose. So long as I had them to search for, I had something to do. When the decree for my liberation as an exile was brought to me the jailer found me on my knees hunting for one which had escaped me for two days. They saved my wife's husband from lunacy. My wife, therefore, could not desire a prouder ornament."

The Wheat Harvest of 1879.

The wheat crop of the whole world for 1879 shows a deficiency of over 375,000,000 bushels, nearly 200,000,000 bushels of the deficiency falling to Europe. The following table, compiled from the *Bulletin des Halles et Marchés,* shows the yield for each large wheat raising country compared with the average yield:

	Average Yield Bushels.	Yield for 1879. Bushels.		Average Yield Bushels.	Yield for 1879. Bushels.
United States	337,500,000.	337,500,000	Roumania	27,000,000.	22,500,000
France	230,172,000.	172,125,000	Belgium	19,150,000.	14,650,000
Russia	180,000,000.	157,500,000	Portugal	6,750,000.	5,675,000
Germany	99,000,000.	90,000,000	Algeria	20,500,000.	16,875,000
Spain	94,500,000.	78,750,000	Canada	13,500,000.	13,500,000
Italy	87,550,000.	67,500,000	Australia	13,500,000.	14,650,000
Austria-Hungary	76,500,000.	63,000,000	Egypt	13,500,000.	11,500,000
Gt. Britain	83,500,000.	47,500,000	Netherlands	4,615,000.	3,375,000
Turkey	34,500,000.	29,500,000	Greece	3,500,000.	3,375,000
			Servia	3,375,000.	2,812,500
			Denmark	2,250,000.	2,250,000

How to Obtain Sleep.

The following is recommended as a cure for sleeplessness: "Wet half a towel, apply it to the back of the neck, pressing it upward toward the base of the brain, and fasten the dry half of the towel over so as to prevent the too rapid exhalation. The effect is prompt and charming, cooling the brain and inducing calmer, sweeter sleep than any narcotic. Warm water may be used, though most persons prefer cold. To those who suffer from over-excitement of the brain, whether the result of brain work or pressing anxiety, this simple remedy has proved an especial boon."

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Scientific Politicians.

Says *Nature,* Marat, the notorious hero of the first French Revolution, the same who met his death at the hands of Charlotte Corday, was the author of several important works on electricity. This fact, which is not generally known, was recently brought to notice by M. A. J. Frost, who is editing the catalogue of the Ronalds Library. Most of Marat's works were written between 1779 and 1785, and several of them were translated into German. Marat was not the only one of the prominent figures of the time who worked in physical science. Arago, though his fame does not rest upon his political achievements, once enacted a chief part in the crowning of the statue of Liberty. "Citizen" Charles was as famous among the revolutionists as for his scientific attainments. Robespierre wrote an article on the lightning conductor for the *Journal des Savants;* and last, but not least, Napoleon Bonaparte on many occasions dabbled in scientific lore, and was the liberal patron of men of science.

ELECTRIC LAMP TESTS.

The Annual Report of the United States Lighthouse Board for the year ending June 30, 1879, contains an appendix that will prove valuable to all that are interested in the study of the electric light, the different methods by which it is generated, and their relative merits and disadvantages. It contains a very full list of the appliances devised in recent times, with concise descriptions of the apparatus and principles involved, illustrated by excellent cuts, some of which have appeared in the columns of the SCIENTIFIC AMERICAN, and others taken from Dr. H. Schellen's recent work. Its compact form renders it very convenient for reference. This portion of the report had its origin in a suggestion made last fall by the chairman of the Lighthouse Board to President Henry Morton of the Stevens Institute to test the various machines and lamps in use with the view of determining their relative efficiency.

It was found that there are three ways of producing electric illumination: 1. By means of the electric arc; 2. By ignited conductors; and 3. By incandescent gases, the latter of which is hardly of practical utility.

To overcome the difficulties connected with the use of the electric arc, which consist in its unsteadiness, in the wearing away and the combustion of the carbon electrodes, etc., numerous regulators have been devised. "The difficulty with all these," we are told, "is, that however well they may regulate everything else, they cannot regulate the minute accidental variations in the structure of the carbon poles during their consumption." The effect of this is to wear away the poles unequally and to cause the arc to shift its position, so that in the space of a few minutes, the intensity of the light measured in a given direction fluctuated between 400 and 2,000 candle power. Nevertheless, since the great improvements recently made in the homogeneity of the carbon poles and in the regulating machinery, and since the introduction of reflectors, the electric arc is no longer too unsteady to use for practical purposes.

In the production of the electric light by ignited conductors, the difficulties are that there is a great wastefulness of energy and consequent costliness, and that the conductors are rapidly disintegrated. A current that would furnish an electric arc of 1,000 to 2,000 candle power would not generate a light of more than 50 to 100 candles when used to ignite a platinum wire, and the platinum so used would soon become brittle and break up.

Higher temperatures were obtained with small rods of carbon placed in exhausted tubes, but they were soon vaporized and disintegrated. At this time Edison had not yet given up platinum. The report concludes that none of the lamps so constructed have proved practically useful as yet, and then goes on to give an historical account of the different inventions of this class for future reference. To show the loss of energy resulting from the division of the current several experiments are described. In one of them a given current produced a light of 65 burners when concentrated on a single lamp; when divided between two lamps, it was reduced to 7½ burners each; among three lamps to 1⅛ burners each, among four to ¾; and among five to ½ burner.

The subject of electromotors, or instruments for producing electric currents, is treated next. To show that the galvanic battery is not economical, the following calculation is made. Weight for weight coal has almost six times the available energy of zinc, and the price of zinc is about 25 times that of coal. Hence to make gas from coal and burn it will be cheaper than to obtain electricity from zinc and turn it into light, unless the loss in the former case is 150 times greater than in the latter.

It follows from this that electric lighting did not become a practical problem until 1831, when Faraday discovered the fact that electricity could be produced from magnetism. Since then numerous magneto-electric machines have been invented, seventeen of which are described and their principles explained. Of these the following were tested in the Physical Laboratory of the Stevens Institute: the Siemens, the Wallace-Farmer, the Brush, the Arnoux-Hochhausen, the Weston, and the Maxim.

The Wallace-Farmer and the Arnoux-Hochhausen machines having been withdrawn after preliminary trials, the remainder were thoroughly tested to find out which was best adapted for use in the Lighthouse Department.

To measure the intensity of the light, Sugg's photometer was used in a dark room temporarily fitted up in the Physical Laboratory. At the same time the power employed to drive the machine was measured by means of a transmitting dynamometer designed by Mr. William Kent, a graduate of the Stevens Institute.

In the following table will be found a résumé of the results obtained. The first column contains the name of the magneto-electric machine used in each series of experiments; the second contains the kind of self-regulating lamp employed, the word "hand lamp" indicating that the distance between the carbons was regulated by hand; the third column shows the amount of illumination; thus in the first line the figure number 3,297 means 3,297 times the light obtained from one standard candle burning two grains of stearine a minute; the fourth column indicates the horse power actually used; and the last column, found by dividing the third by the fourth, shows the number of candles obtained per horse power:

Machine.	Lamp.	Average candle power.	Average horse power.	Av'ge candle power per horse power.
Maxim (ordinary type)..	Maxim	3,297	5·483	729
Maxim.....	Hand lamp	3,930	5·585	704
Siemens	Siemens.....	4,651	4·863	956
Siemens	Siemens	4,548	4·742	959
Weston	Hand lamp	8,585	4·769	1,800
Weston	Maxim	7,787	4·683	1,663
Weston.....	Siemens.....	7,262	5·056	1.436
Weston	Weston	6,063	4·552	1,332
Maxim (with magnets of low resistance)...	Maxim	7,524	7·400	1,017
Brush..	Brush	4,365	2·8467	1,533
Brush.....	Siemens.....	3,532	2 9573	1,194

The report concludes with the following words: "In conclusion, your committee would report that they find several of the machines and lamps, with which they have experimented, sufficiently efficient and reliable to warrant further experiment in the nature of a practical test in one of the coast lighthouses." C. F. K.

The Melbourne Exhibition of 1880.

Mr. Thos. R. Pickering, United States Government Agent for the Melbourne Exhibition, publishes the following general regulations of the Royal Colonial Commission:

1. The Exhibition will be opened on the 1st day of October, 1880, and closed on the 31st day of March, 1881. It will be open evenings.

2. There are no differential duties, and all exhibits will be admitted free of duty for the purpose of exhibition. Facilities will be given for the sale of exhibits, delivery to be made after the close of the Exhibition.

3. The protection of inventions capable of being patented, and of designs, is secured by the patent laws of Victoria.

4. If exhibits are *not* intended for competition it should be so stated by exhibitors, that they may be excluded from examination by the International Jury.

5. The general reception of articles in the Exhibition buildings will commence on June 1, and no articles will be received after August 31t. Arrangements will be made for transporting goods from the port of Melbourne, or the several railway stations, to the Exhibition grounds, at a fixed rate of charges.

6. All expenses of freight, marine insurance, etc., should be prepaid by the exhibitor, but if that be inconvenient, the Victorian General Commission, through its agents in New York and Boston, will, if desired, undertake the transportation, custom house formalities, unpacking and arranging the products for exhibition, the expense incident upon such work to be regarded as a first charge upon the exhibits, to be deducted from the net proceeds in the event of their being sold. Should such exhibits, however, not be sold, but be claimed by the exhibitor or his authorized agent at the close of the Exhibition, then such sums as may have been disbursed by the Commission or any of its agents must be paid before such goods are delivered.

7. No work of art nor any article whatever exhibited in the buildings, parks, or gardens, may be drawn, copied, or reproduced in any manner whatsoever without the permission of the exhibitor. The Commission reserves the right of authorizing the production of general views.

8. By the introduction of steam power, which will be supplied gratuitously, it is proposed to afford facilities for presenting not only the machinery for any given manufactures, but the manufactures themselves; and it is further intended that space shall be afforded for the production in the Exhibition of interesting objects by manual labor.

9. The Victorian General Commission is prepared, if required, to make arrangements for the construction of showcases by contract at a price per cubic foot, the cost to be borne by the exhibitor using the same.

10. The Commission will take precautions for the safe preservation of all articles in the Exhibition, but will be in no way responsible for damage or loss of any kind, or accidents by fire or otherwise, however caused; facilities will be afforded exhibitors for insuring their goods.

11. The awards shall be based upon written reports adopted by the jurors.

Reports and awards shall be based upon inherent and comparative merit, the elements of merit being held to include considerations relating to originality, invention, discovery, utility, quality, skill, workmanship, fitness for the purposes intended, adaptation to public wants, economy, and cost.

Awards shall consist of gold, silver, and bronze medals, and a certificate of honorable mention, together with a special report of the jurors on the subject of the award.

Each exhibitor shall have the right to produce and publish the report awarded to him, but the Commission reserves the right to publish and dispose of all reports in the manner it thinks best for public information, and to embody and distribute the reports as records of the Exhibition.

No commissioner who is an exhibitor or a member of a firm exhibiting shall take any part in the selection or appointment of jurors in those classes in which he exhibits.

No person interested either as a partner or *employé* in a house exhibiting shall be a juror in the classes in which such house or person exhibits.

The size of the medals (for prizes) will be two inches and a half, the design having been adopted.

12. Exhibitors are particularly requested to mark the trade price of the articles exhibited, so as to facilitate the judgment of the jury, as well as for the information of visitors.

13. Exhibitors will not have to pay rent for space occupied by them in the Exhibition.

REGULATIONS FOR THE UNITED STATES SECTION.

Congress having made no appropriation for the payment of freight upon goods sent to the Australian Exhibitions, and having assigned no government vessels to the duty of transportation, the United States Commission will assume no direction whatever of the movement of goods either to or from Australia.

Upon the delivery of the goods within the Exhibition buildings at Melbourne, and the payment of all charges by the exhibitors, the United States Commission will see that they are properly assigned to the space allotted the United States, and that they are catalogued.

The expense of installation must be borne by the exhibitors, and the United States Commission will not be responsible for expense of any kind in connection with the handling, storage, or the loss or injury of exhibits.

An agent with written authority duly filed, and whose qualifications are satisfactory to the Secretary of the United States Commission, will be the acknowledged representative of an exhibitor, but when goods are exhibited in the name of an agent—awards, though recommended by jurors, are not allowed by International Commissions; it would be well, therefore, for those who intend exhibiting for competition to make application in their own name.

The Buenos Ayres Exhibition.

The following are the principal regulations affecting exhibitors at the forthcoming South American Industrial Exhibition, to be held in Buenos Ayres in 1880:

1. The Exhibition will be opened on September 15 and closed on December 15, 1880. 2. Foreign exhibitors of industrial, agricultural, and all other machinery, suitable for the requirements of this country, admitted in accordance with the regulations of the Exhibition. 3. Applications for space required must be made on or before the 1st of May, 1880, addressed Al Presidente de la Comision Esposicion, Secretaria de Club Industrial, Buenos Aires. 4. The charge to foreign exhibitors will be 5 dols. (1*l.* sterling) per square meter. 5. Articles intended for exhibition will be admitted from the 15th of June to the 15th of August, 1880. 6. No articles presented for exhibition can be removed until the close of the Exhibition. 7. All articles exhibited must figure under the name of the parties soliciting their admission, and any prizes awarded will be given in the same name. 8. Exhibitors may inscribe the names of the manufacturers or agents on the goods exhibited as well as their own. 9. All goods intended for the Exhibition will be admitted by the Customs free of duty, but must come expressly for the Exhibition, and as a guarantee that such is the case, each lot of goods must come accompanied by a certificate from the Argentine Consul at port of shipment. 10. All goods not reshipped after the close of the Exhibition must pay the customary duties.

We learn from the Argentine Consul General, No. 60 Wall St., New York, that foreigners can only compete in respect to exhibits of improved machinery.

Scientific Societies.

At recent meetings of scientific and professional societies in this city, officers for the ensuing year have been elected as follows:

New York Academy of Sciences: President, John S. Newberry; First Vice-President, Thomas Eggleston; Second Vice-President, B. N. Martin; Corresponding Secretary, A. R. Leeds; Recording Secretary, O. P. Hubbard; Treasurer, J. H. Hinton; Council, D. S. Martin, G. N. Lawrence, A. A Julien, A. C. Post, W. P. Trowbridge, Louis Elsberg; Curators, B. G. Amend, C. F. Cox, B. B. Chamberlin, Charles A. Seeley, W. H. Leggett; Finance Committee, T. B. Coddington, Philip Schuyler, Thomas Bland.

American Ethnological Society: President, Alexander J. Cotheal; Vice-Presidents, Charles E. West, LL.D., and Charles C. Jones, Jr.; Corresponding Secretary, Charles Rau; Recording Secretary, T. Stafford Drowne, D.D.; Treasurer, Alexander J. Cotheal; Librarian, Henry T. Drowne; and Executive Committee, George H. Moore, LL.D., Asa Bird Gardner, LL.D., and Henry T. Drowne.

American Institute of Mining Engineers: President, Wm. P. Shinn., of St. Louis, Mo.; Vice-Presidents (in place of those whose term expires this month), James A. Burden, of New York; Dr. Charles B. Dudley, of Altoona, Penn.; and Persifer Frazer, Jr., of Philadelphia. Managers (in place of those retiring this month), James C. Bayles, of New York; W. S. Keyes, of San Francisco; and Percival Roberts, Jr., of Philadelphia. Treasurer, Theodore D. Rand, of Philadelphia; Secretary, Dr. Thos. M. Drown, of Easton, Pa.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

☞ *The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.*

Vertical & Yacht Engines. T.P.Pemberton, 276 Water St., N. Y.

Brick Presses for Fire and Red Brick manufactured at 309 S. Fifth St., Phila., Pa. S. P. Miller & Son.

The great advantage of the genuine Asbestos Coverings for Steam Pipes, Boilers, etc., over any other forms of non-conducting coverings, aside from their superior effectiveness, is that they are manufactured in convenient form ready for use, and can be easily applied without the aid of skilled labor. The H. W. Johns M'f'g Co., 87 Maiden Lane, N. Y., are the sole manufacturers.

Having bought the Forsythe Scale Works here, we offer our present manufactory, with 25 H. P. engine and boiler, for sale. This property is well situated for manufacturing, only three blocks from depot. Will be sold low. Waukegan, Ill., is 35 miles north of Chicago. Full description sent on application. Powell & Douglas, M'f'rs Pumps and Windmills, Waukegan, Ill.

For Sale cheap.—Williams' Standard Switch Board and District Hook Bells for Telephone Exchange. Address Exchange, Burlington, Vermont.

Practical Founder or Machinist, with some capital, desirous of going West. Box S, Helena, Montana, T.

Wanted—A pair of Hoisting Engines, cylinders 6 x 9 or thereby; new or second-hand, in good condition. Carnegie & Co., Larimer, Pa.

For Sale.—A small Iron Planer. W.W. Oliver, Buffalo, N. Y.

Wanted—The address of 40,000 Sawyers and Lumbermen for a copy of Emerson's Hand Book of Saws. New edition 1880. Over 100 illustrations and pages of valuable information. Emerson, Smith & Co., Beaver Falls, Pa.

Spokes and Rims, white oak and hickory, best quality to any pattern, and Hammer Handles of best hickory. John Fitz, Martinsburg, West Va.

Patent for Walter's Method of Carpeting Stairs, illustrated in this number, for sale cheap.

Wanted—Scrap Iron, car lots. Box 502, Pittsburg, Pa.

For the best Stave, Barrel, Keg, and Hogshead Machinery, address H. A. Crossley, Cleveland, Ohio.

For Iron Gas Pipe, see adv. on inside page.

Sidewheel Yacht Engines, boats drawing 6 to 10 in. water, in pairs. Ad. T. & K., Owego, Tioga Co., N. Y.

Collection of Ornaments.—A book containing over 1,000 different designs, such as crests, coats of arms, vignettes, scrolls, corners, borders, etc., sent on receipt of $2. Palm & Fechteler, 403 Broadway, New York city.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 126.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box423, Pottsville, Pa. See p. 125.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Sheet Metal Presses. Ferracute Co., Bridgeton, N. J.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Wright's Patent Steam Engine, with automatic cut-off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Bradley's cushioned helve hammers. See illus. ad. p. 110.

Forsaith & Co., Manchester, N. H., & 213 Centre St., N. Y. Bolt Forging Machines, Power Hammers, Comb'd Hand Fire Eng. & Hose Carriages, New & 2d hand Machinery. Send stamp for illus. cat. State just what you want.

Electrical Indicators for giving signal notice of extremes of pressure or temperature. Costs only $20. Attached to any instrument. T.Shaw, 915 Ridge Ave. Phila.

Instruction in Steam and Mechanical Engineering. A thorough practical education, and a desirable situation as soon as competent, can be obtained at the National Institute of Steam Engineering, Bridgeport, Conn. For particulars, send for pamphlet.

Hydraulic Jacks, Presses and Pumps. Polishing and Buffing Machinery. Patent Punches, Shears, etc. E. Lyon & Co., 470 Grand St., New York.

Steam Engine for sale very low. See advertisement on another page.

Portable Forges, $12. Roberts, 107 Liberty St., N. Y. For Mill Mach'y & Mill Furnishing, see illus. adv. p. 141.

Telephones repaired, parts of same for sale. Send stamp for circulars. P. O. Box 205, Jersey City, N. J.

Eclipse Portable Engine. See illustrated adv., p. 94.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Large knife work a specialty. Also manufacturers of Soloman's Parallel Vise. Taylor, Stiles & Co., Riegelsville N. J.

The Twiss Automatic Cut-off; also Vertical and Yacht Engines. N. W. Twiss, New Haven, Conn.

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Company, Buffalo, N. Y.

New Inventions examined and tested. Designs and improvements. Reports for investors. Recipes and information on all industrial processes. Benjamin's Sci. Expert Office, 37 Park Row, New York.

Ice Machines selected. Information on all kinds. Benjamin's Sci. Expert Office, 37 Park Row, New York.

Chase's Pipe Cutting & Threading Machine. Send for circular. Chase Machine Co., 120 Front St., New York.

Diamond Planers. J. Dickinson, 64 Nassau St., N. Y.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Eagle Anvils, 9 cents per pound. Fully warranted.

Cylinders, all sizes, bored out in present positions. L. B. Flanders Machine Works, Philadelphia, Pa.

For Wood-Working Machinery, see illus. adv. p. 156.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus'd adv. p. 62.

Elevators, Freight and Passenger, Shafting, Pulleys, and Hangers. L. S. Graves & Son, Rochester, N. Y.

The Horton Lathe Chucks; prices reduced 25 per cent. Address The E. Horton & Son Co., Windsor Locks, Conn.

$275 Horizontal Engine, 20 H. P. See page 156.

Emery Wheels of all kinds, and Machines at reduced prices. Lehigh Valley Emery Wheel Co., Weissport, Pa.

Pat. Steam Hoisting Mach'y. See illus. adv., p. 158.

Hydraulic Cylinders, Wheels, and Pinions, Machinery Castings; all kinds; strong and durable; and easily worked. Tensile strength not less than 65,000 lbs. to square in. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

Drop Hammers, Die Sinking Machines, Punching and Shearing Presses. Pratt & Whitney Co., Hartford, Ct.

Rue's New "Little Giant" Injector is much praised for its capacity, reliability, and long use without repairs. Rue Manufacturing Co., Philadelphia, Pa.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

Elevators.—Stokes & Parrish, Phila., Pa. See p. 158.

Improved Solid Emery Wheels and Machinery, Automatic Knife Grinders, Portable Chuck Jaws. *Important*, that users should have prices of these first class goods. Address Amer. Twist Drill Co., Woonsocket, R.I.

NEW BOOKS AND PUBLICATIONS.

THE AMERICAN ANTIQUARIAN. A Quarterly Journal devoted to Early American History, Ethnology, and Archæology. Edited by Rev. Stephen D. Peet. Chicago: Jameson & Morse. Vol. II., No. 2.

A very creditable and thoroughly scientific periodical, doing good work in a field of real importance.

THE ANTIQUARY. A Magazine devoted to the Study of the Past. Edited by Edward Walford, M.A. New York: J. W. Bouton. No. 1, Vol. I.

A thoroughly English magazine likely to delight the dilettante gatherer of antiquated trifles, devoted chiefly to historical and biographical matters pertaining to the British islands and the British people.

HOW TO LEARN SHORTHAND. By Arthur M. Baker. New York: S. R. Wells & Co. Paper, pp. 43.

Claims to be an improvement upon Taylor's system of stenography, and to be the simplest, most practical, and the best adapted system of shorthand for reporting. There are probably not more than twenty systems before the public that are better.

THE REFUTATION OF DARWINISM AND THE CONVERSE THEORY OF DEVELOPMENT. By T. Warren O'Neill. Philadelphia: J. B. Lippincott & Co.

Another illustration of the facility with which the theory of evolution can be overturned by those who have but a second hand knowledge (and little at that) of the facts of natural history. As a constructive theorist Mr. O'Neill is as fearless as he is in the work of destroying Darwinism; but we do not apprehend that naturalists will be greatly influenced by his views.

THE SUGAR BEET: INCLUDING A HISTORY OF THE BEET SUGAR INDUSTRY IN EUROPE. By Lewis C. Ware. Illustrated. Philadelphia: Henry Carey Baird & Co. 8vo, cloth, pp. 323. Price $4.

In addition to a detailed account of the varieties, qualities, cultivation, feeding value, etc., of the sugar beet as developed in Europe, this thoroughly practical treatise reviews at considerable length the history, present condition, and future prospects of the beet sugar industry in this country. The author is confident that before long the $80,000,000 annual tribute we pay to foreign countries for sugar will be kept at home, and that the sugar beet will be one of the chief means for enabling the people of the United States to produce all the sugar they require.

SIXTH QUARTERLY REPORT OF THE PENNSYLVANIA BOARD OF AGRICULTURE. Harrisburg: Lane S. Hart, State Printer.

Contains a report of the fall meeting of the Pennsylvania Board of Agriculture; reports of the past year's crops in comparison with the yield of the year before; the condition of growing crops and of farm stock; prices of farm products, etc. Also a useful paper on the lung plague among cattle, and other information of use to Pennsylvania farmers.

THE MICROSCOPE IN MEDICINE. By Lionel S. Beale. Philadelphia: Lindsay & Blakiston. 8vo. pp. 539. Price $7.50.

This is the fourth edition of Professor Beale's well known treatise much enlarged. Most of the 500 illustrations have been drawn on wood by the author. The index, which contains over 2,000 references, fairly indicates the encyclopedic character of the work. It is somewhat remarkable that an edition for American use should not have contained some American names and addresses in the list of "microscope makers and others useful to microscopical observers."

THE COMPEND OF TAKIGRAPHY. By D. P. Lindsley. New York: D. Kimball. 12mo, paper, pp. 34.

Contains a summary of the principles of the simple style of takigraphy, a system of shorthand writing which deservedly ranks among the best.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) C. H. B. asks how to color glue. A. Use any of the soluble coal tar aniline dyes.

(2) E. S. asks: 1. Could you suggest a clear transparent and quickly drying varnish to preserve sphymographic tracings on mica slides? A. Try the following: Gum juniper, 2 drachms 8 grains; gum frankincense, 1 drachm 10 grains; alcohol, 4 ounces. Filter through paper, and use the clear solutions. 2. Give a method by which the tracings could be transferred to a record book. A. We know of nothing better than a solar print.

(3) W. H. C. asks for the best acid or mixture for scouring and polishing copper. A. Solution of oxalic acid is commonly employed. Finish with whiting.

(4) C. R. writes: We are using the condensed water from exhaust steam in the boiler, and find that the grease in it makes the boiler foam. Would coal oil cut the grease and precipitate it so that we could blow it off? If not, what do you suggest? A. Try a small quantity of lime (caustic) and use the blow-out. Petroleum would be of little use.

(5) I. G. B. asks the name of the very bright star now to be seen near the horizon about due south. Please state all that will be of any interest. A. It is Sirius, the dog star. It is estimated that it gives us four times as much light as any other star visible in our latitude. It was for a long time supposed that Sirius had a companion, but it was not actually seen until February 1862, when the younger Mr. Clark, of the firm of Alvan Clark & Sons, the well known telescope makers, turning upon the star the eighteen inch glass then just completed for the Chicago Observatory, saw it. The satellite was discovered exactly in the predicted direction for that time, though the discoverer was not aware of this fact at the time.

(6) A. B. asks how to make emery belts for polishing spokes and other wood work. A. Take emery or sharp sand, spread it out on an iron plate heated to about 200° Fah. Apply to your straps or belts a rather thin coating of strong glue, then press it upon the heated emery or sand. Either leather or cotton webbing may be used for the belt.

(7) B. J. R. asks: How is carbon tracing or copying paper used for duplicating writing in pencil prepared? A. Rub into a suitable tissue a mixture of 6 parts of lard, 1 part of beeswax, and sufficient fine lamp black to give it a good color. The mixture should be warm and should not be applied to excess.

(8) J. H. P. asks where to find a full explanation of the theory that the *top* of a carriage wheel moves faster than the *bottom* when the carriage is moving. A. P. 394, Vol. 39, SCIENTIFIC AMERICAN.

(9) A. S. G. writes: Tell J. B. R. (No. 40, in No. 8) that I have had exactly the same experience as he, with four Watson cells, and, after charging it to every cause but the right one, removed the trouble by taking out the zincs and cleaning them with a stiff brush. I know this is contrary to directions, so much the worse for them.

(10) G. L. B. asks: What is the ratio of increase of resistance to that of speed, to an object drawn through water? A. Nearly as the square of the velocity; at high velocities not quite so much, as the friction does not increase as the square of the velocity.

(11) W. J. P. writes: In your issue of February 28, in "Notes and Queries," No. 10, W. E. K. asks how to take a large coal oil spot out of a carpet. If it is of any value. I give you my experience. A kerosene lamp was carelessly dropped in the center of my parlor carpet. I drew the tacks nearest to it and drew out the paper under the spot and put in four thicknesses of newspaper. I then strewed over the spot common whiting to the depth of about half an inch, which I covered with a large paper to prevent tracking, etc. I left it a week, and then scraped up the whiting and raising the carpet a few inches from the floor I whipped it with a light switch to start the whiting, after which the spot was carefully swept. The oil had disappeared. This was four years ago, and no brighter spot is on the carpet than the place so treated.

(12) A. M. M. asks: 1. Will any kind of battery answer for silver or gold plating? If not, which is best? A. For light work the Smee battery is generally used. For heavy work use a carbon battery with electro-poin fluid in the porous cell. 2. How are solutions prepared for silver and gold plating? A. For silver bath, see p. 27 (2), Vol. 41, SCIENTIFIC AMERICAN, for gilding bath, see SUPPLEMENT, 160. 3. Can an electric lamp be operated with a battery? A. Yes, but not economically. It will take 50 cells of Bunsen battery to get a fair light. Better use a machine.

(13) J. G. S. asks: 1. What wire is it necessary to use between stations using the telephone described in No. 142, SCIENTIFIC AMERICAN SUPPLEMENT—that is, size; material, copper, or iron? A. Use No. 9 galvanized iron wire. 2. Is there any simpler calls than those described in SCIENTIFIC AMERICAN SUPPLEMENT in No. 162? A. A single stroke electric bell is the simplest call.

(14) P. T. writes: One party claims that anchor ice runs at night and whatever it touches it clings to. An opposite party claims that it does not run at night, but freezes on the bottom, and rises and runs when the sun warms the water sufficient to loosen from the bottom. Which is right? A. The latter.

(15) M. P. B. writes: 1. Suppose a perfectly round wheel to be rolling on a perfectly smooth surface, is the part of the wheel which touches the surface on which it is rolling at rest for the instant? A. Yes. 2. Does a cane gun come under the head of concealed weapons? If so why? A. Yes, because the weapon is concealed or disguised. 3. Does the piston rod of an engine come to rest at the end of each stroke before beginning the next? A. Yes.

(16) D. O. asks: 1. Is an engine with cylinder 2½ inches diameter by 5 inches stroke with 100 lb. steam powerful enough to drive a propeller 20 inches diameter with 36 inches pitch? A. Yes. 2. What speed may I expect with boat 22 feet long and 5 feet wide, of good model? A. With plenty of boiler, 8 miles per hour.

(17) E. S. asks: 1. Is it necessary that a locomotive engine have two cylinders. If so, why? A. Yes, so that the engines can be started from any position. 2. What size engine used as a locomotive will it require to draw 12 cars weighing 800 a piece up a grade 4 feet per 100, that is, not allowing for slipping of the drive wheels on the rails? A. Your data is quite insufficient; you do not give size of driving wheels, pressure of steam, or speed.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

B.—Hematite and chalcopyrite.—W. K.—Not emery, but garnet in quartz.

COMMUNICATIONS RECEIVED.

On Experiments in Magnetism. By H. E. E.
On Activity on Jupiter's Disk. By I. S.
On Russian System of Shop Instruction. By W. F. D.
On a Curious Dust Formation. By B. N.
On Copper Nails. By J. A. B.
On the Force and Heat of Light. By C. B. M.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

February 10, 1880,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, or any patent issued since 1867, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Alcoholic spirits, manufacturing, J. R. Gladney	224,419
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English Patents Issued to Americans.

From February 6 to February 10, 1880, inclusive.

Axle boxes, railroad, T. A. Bissell, Detroit, Mich.
Bedsteads, O. Howe, Cambridge, Mass.
Bolt heading machine, J. B. & S. C. Clark, Plantsville, Conn.
Checks, etc., preventing alteration of, etc., J. Gurney, New York city.
Furnace, blast, J. F. Bennett, Port Carbon, Pa.
Gaskets, W. Wallace *et al.*, Ansonia, Conn.
Harvesting machine, C. W. Marsh, Sycamore, Ill.
Photographic apparatus, T. H. Blair, Franklin, Mass.
Sewing machine driving and lubricating apparatus, R. Whitehill, New York city.
Slate and frame machine, E. J. Williams, Slatington, Pa.
Sound transmitting apparatus, T. Graydon, Cincinnati, Ohio.
Spring for railroad and other vehicles (2), J. S. Williams, Riverton, N. J.
Springs, machinery for bending and forming, C. F. Shoemaker, Cleveland, Ohio.
Telephonic apparatus, G. L. Anders *et al.*, Everett, Mass.
Topophone, or apparatus for determining the direction of sound, A. M. Mayer, South Orange, N J.
Torpedo boats, W. H. Mallory, Bridgeport, Conn.

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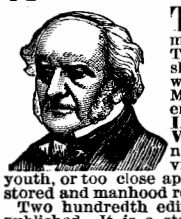

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Address Dr. W. H. PARKER, No. 4 Bulfinch Street, Boston, Mass. The author may be consulted on all diseases requiring skill and experience.

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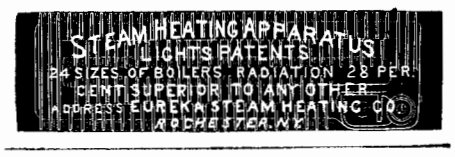
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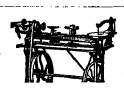

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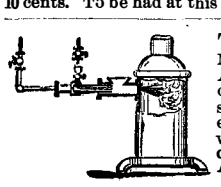

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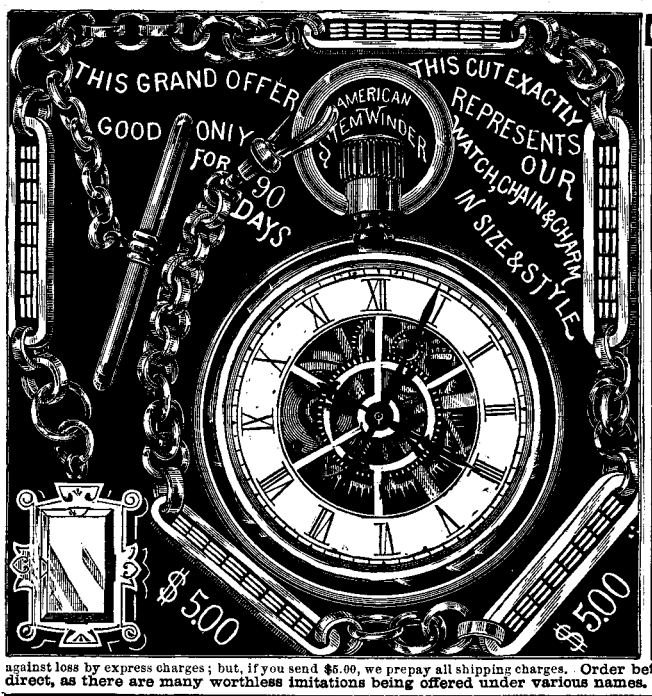
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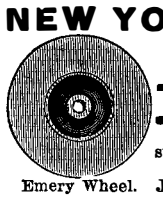

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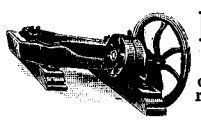

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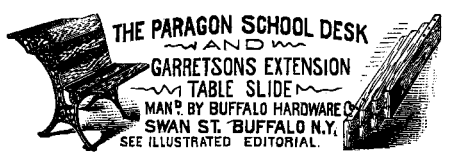
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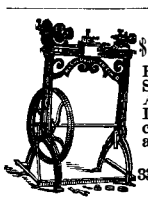

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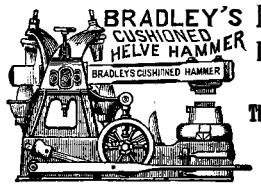

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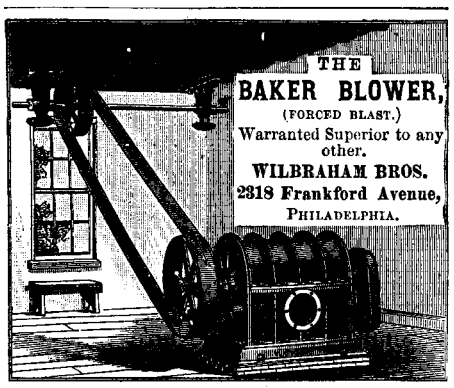

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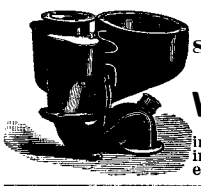

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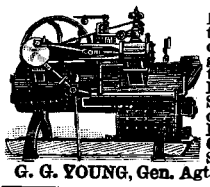

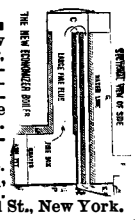

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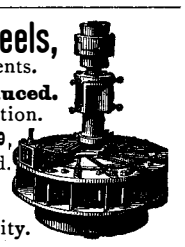

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